

AMERICAN MUSEUM
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DECEMBER, 1922.

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Vol. XXIX. No. 9.

DECEMBER, 1922.

NOTES FOR THE MONTH.

CONSEQUENT on the appointment of Sir Arthur Boscawen as Minister of Health, Lt.-Col. Sir Robert A Sanders, M.P.,

Appointment of formerly Under Secretary of State for
New Minister. War, has been appointed Minister of
Agriculture and Fisheries.

The Right Hon. the Earl of Ancaster has been re-appointed Parliamentary Secretary to the Ministry.

* * * * *

THE following letter addressed by the Prime Minister to the National Farmers' Union, in reply to an inquiry asking for a definition of his attitude to agricultural questions, was published in the Press on 14th November:—

**Prime Minister's
Letter to the
National
Farmers' Union.**

“ With further reference to your letter of the 24th ult., I am desired by the Prime Minister to say that he regrets that it has not been possible in the short time available for the Government to come to a final decision as to what measures can be taken to assist the agricultural industry.

“ The Government fully realizes the grave difficulties with which agriculture is faced, but it must be recognized that such remedies as subsidies or protective duties on foodstuffs are out of the question under present circumstances.

“ At the same time, there are certain directions along which, in the opinion of the Prime Minister, the Government might usefully explore the possibility of helping this great industry. These are:—

“An inquiry with all reasonable dispatch into the subject of agricultural rating and the removal of any unfairness which might be found to exist.

“The promotion of co-operation in the transport and sale of agricultural produce.

“The encouragement of improved credit facilities to agriculturists and the promotion of education and research.

“Useful results might also be obtained from an inquiry into the causes of the great disparity between the price received by the farmer for his produce and that paid by the consumer of food. All these questions are being carefully examined, and there will be no avoidable delay in coming to a decision as to the form in which assistance on such lines can best be given.

“On these lines the Prime Minister believes that it should be possible to build the foundations of a permanent and stable agricultural policy, which will enable the enterprise and industry of the agricultural community to work out its own salvation under fair and reasonable conditions.”

* * * * *

It has already been announced* that the British and Canadian representatives at the Cattle Conference agreed as to the conditions that should apply to the importation of cattle from Canada.

Importation of Canadian Cattle.

The agreement has now been ratified by the new Cabinet and by the Prime Minister of Canada, and the following summary of the agreement has, with the assent of the Canadian authorities, been authorised for publication:—

Canadian store cattle (*i.e.*, animals born and reared in Canada and rendered incapable of breeding) are to be admitted under the following restrictions:—

(1) The shipment must be from a Canadian port and direct to a port in Great Britain.

(2) For three days immediately before shipment and during the voyage the animals are to be kept separate from other animals and periodically examined by a veterinary officer of the Dominion. A thorough examination immediately before shipment is to be made by the Dominion veterinary officer, who will certify that the animals are not affected with cattle plague, pleuro-pneumonia, foot-and-mouth disease, or mange. During the voyage the examination is to be made daily.

* This *Journal*, November, 1922, p. 676.

(3) The animals are to be landed at specified landing places and there thoroughly examined by the Ministry's veterinary officers. Movement from the landing place is to be controlled by licence in the same manner as the movement of imported Irish cattle is at present controlled. This secures detention of the animals on some farm or other premises for six days, though they may pass to such premises through one market.

The agreement makes provision to secure that the vessels used shall not be capable of infecting the cargo and also provides for effective action if disease should be found in a cargo.

The landing of Canadian cattle capable of breeding will require the authority of a General Order which will be made by the Minister of Agriculture and Fisheries and laid in draft before both Houses of Parliament for thirty days, and if either House before the expiration of that period presents an address to His Majesty against the draft or any part thereof, no further proceedings shall be taken thereon. It is an essential part of any such order that the animals must be accompanied by a certificate by the authorised officer of the Dominion stating that the animals have within one month before shipment been tested effectively for tuberculosis and found free from that disease, and the Minister is given the fullest discretion as to the precautions to be enforced against the introduction of other diseases by these animals.

The Minister is to retain the power to suspend importation of store and breeding animals if cattle plague, pleuro-pneumonia, or foot-and-mouth disease should appear in Canada.

A fee not exceeding sixpence per animal is to be imposed on all imported animals, and compensation is not payable in case of slaughter at the place of landing in consequence of disease being discovered. For administrative purposes imported animals are to be tagged or otherwise marked.

The Canadian Ministers at the Conference undertook that as soon as the necessary Order authorising importation of Canadian breeding stock is in force, the Canadian Government will modify their conditions of importation of British animals so as to make the Canadian and British conditions reciprocal.

The Conference assented to the view that legislation on this subject cannot be limited to Canada but must be capable of adaptation to the requirements of other parts of the British Empire.

* * * * *

IN view of the present interest in agricultural wages, the following article is reprinted from the *Agricultural Market Report*:—

In recent discussions as to agricultural wages, reference is usually made on the one hand to the fall in the prices of agricultural produce and on the other to the cost of living. The farmers point out that they are receiving lower prices and cannot consequently continue to pay the same rate of wages as before, while the worker replies that the cost of living has not fallen materially and that he cannot live in comfort on a reduced wage. Whilst conditions vary in different localities and general figures are by no means applicable to individual cases, the Ministry thinks it will be of interest to make such broad comparisons as are possible between the average rates of agricultural wages, the average prices of farm produce, and the cost of living.

**Agricultural
Wages, Prices
and the
Cost of Living.**

For this purpose the agricultural index number which is published monthly by the Ministry is taken as the best indication of the changes in the prices of agricultural produce, and for the cost of living the index number issued by the Ministry of Labour is used. The former shows the average increase in the wholesale prices of British produce sold off the farm in England and Wales, while the latter represents the average increase in the cost of maintaining the pre-war standard of living of working-class families.

In order to make a comparison with these figures the average earnings of ordinary farm workers in England and Wales in 1914 have been taken at 18s. per week. This figure is based on the assumption that the average weekly cash wages of ordinary agricultural labourers in 1914 were about 16s. 9d., and that, in addition, the labourer received certain allowances which were worth on the average about 1s. 3d. per week. Precise accuracy in this matter cannot be attained, but a consideration of the statements made by various authorities suggests that 18s. may be taken as a fairly approximate figure. Comparative figures for 1921-1922 can be based on the rates of wages fixed by Conciliation Committees in areas where agreements have been reached, and on estimates of prevailing wages in the other areas, weighted by the number of workers in the different districts, while for some intervening years the rates fixed by the Agricultural Wages Board can be used. Taking in the first place the seven years from 1914 to 1921 the move-

ment of wages, prices and cost of living was approximately as follows :—

PERCENTAGE INCREASE AS COMPARED WITH PRE-WAR RATES.

<i>Month.</i>			<i>Agricultural Wages.</i>	<i>Prices of Agri- cultural Produce.</i>	<i>Cost of Living.</i>
August ...	1917	...	39	...	97
July ...	1918	...	69	...	123
May ...	1919	...	110	...	132
April ...	1920	...	139	...	199
August ...	1920	...	160	...	177
September ...	1921	...	135	...	116
October ...	1921	...	122	...	86
November ...	1921	...	110	...	79
December ...	1921	...	105	...	76

It will be seen that agricultural wages rose but slowly and failed to keep pace with the increase in the cost of living up to May, 1919, when an adjustment was made which brought them somewhat above that figure. The further increases in wages granted in 1920 appear to have maintained them above the cost of living figures, and notwithstanding the subsequent decline the rates were on the whole favourable to the workers up to the end of 1921.

If a comparison is made between wages and the prices of farm produce, it will be seen that while the latter rose much more rapidly than wages, they also fell more rapidly, so that by the end of 1921 they had reached a lower level than either wages or the cost of living. At the beginning of 1922 a re-adjustment took place which brought wages more closely into relation with farm prices, but left them rather below the increase in the cost of living.

PERCENTAGE INCREASE AS COMPARED WITH PRE-WAR RATES.

<i>Month.</i>			<i>Agricultural Wages.</i>	<i>Prices of Agri- cultural Produce.</i>	<i>Cost of Living.</i>
1922.					
January ...	...	86	...	75	...
February ...	...	83	...	79	...
March ...	...	80	...	77	...
April ...	...	79	...	70	...
May ...	...	78	...	71	...
June ...	...	78	...	68	...
July ...	...	78	...	72	...
August ...	...	76	...	67	...
September ...	...	75	...	57	...
October ...	...	60	...	59	...

The movement in the spring and summer of 1922 was slowly downward, but during October wages have been appreciably reduced in almost all districts with the result that, on the

average, they are now not more than 60 per cent. above the pre-war level, an increase which is almost exactly comparable with the position as regards farm produce, but appreciably below the increase in the cost of living.

The figures for wages given above are averages for the country as a whole, but as is well known the pre-war rates of wages varied considerably in different districts and this variation still continues (though to a somewhat less extent than was formerly the case) the areas where exceptionally low rates were formerly paid having benefited by a rise proportionately greater than that obtained in the better paid areas.

* * * * *

In January, 1919, the Ministry, on the recommendation of the Development Commissioners, obtained Treasury authority to

**Production of
Lactose from
Whey.**

establish and conduct an experimental Lactose Factory, grants for the purpose being provided from the Development Fund.

A site for the factory was thereupon obtained at Haslington, near Crewe, adjoining the premises of a co-operative cheese factory, but owing to unavoidable delay in carrying out the necessary building work and in obtaining suitable plant, etc., the Lactose Factory did not commence work until February, 1921.

The object of the Factory is to experiment in the extraction of lactose and other products from whey, and to ascertain the economic possibilities of the processes adopted.

The circumstances which caused the Ministry to think that it was both necessary and desirable to establish a factory of this kind are as follows:—

(1) One of the phases in the development of the dairying industry which has taken place during recent years is the establishment throughout the country of dairy depots. Some of these depots are owned co-operatively by farmers, and others belong to private individuals or companies. Some depots have been expressly established for the manufacture of cheese; others are for the purpose of dealing with “surplus” milk, often by converting it into cheese, and the result has been the concentration of cheese-making at depots instead of at farm dairies as heretofore.

Cheese-making gives rise to a by-product—whey—which in bulk amounts to about 85 per cent. of the milk used. It therefore follows that the concentration of cheese-making results in a large bulk of whey being produced at the depots.

When cheese-making takes place on farms, the whey, which has a considerable food value, is largely used for pig-feeding, but in the case of depots the amount is too great for it to be used in this manner; also, owing to its bulk and the cost of transit, it is impracticable to convey it from the depots to the farms for use thereon. Whey is consequently largely wasted all over the country to the extent of millions of gallons annually, and its disposal is, moreover, a source of considerable embarrassment to many cheese-making depots at the present time. If turned into sewers it destroys the efficiency of filter-beds; if allowed to pass into streams it causes a state of pollution which gives rise to a nuisance; and if irrigated on land it is liable to pollute the neighbouring wells and to kill vegetation.

(2) Whey contains valuable food materials suitable for human consumption, particularly milk sugar (lactose) lactalbumen, butter fat and mineral salts. Collectively they amount to about $6\frac{1}{2}$ lb. in every 100 lb. of whey.

(3) In this country, while great quantities of lactose are being thrown away in whey, lactose is actually being imported from abroad.

During the year ended 31st March, 1922, satisfactory progress was made with the extraction of crude lactose from the whey received at the factory, and some 15 tons of this crude material were produced.

* * * * *

THE investigations which have been in progress for some years into the methods and costs of field drainage have now

Field Drainage reached an advanced stage, and it should
Investigations. shortly be possible to compile a preliminary report upon the results obtained. In the

course of the investigations, two public demonstrations have been given, one at Aubourn Fen, near Lincoln, in November last year, and one at High Hilden, Tonbridge, in October last. By means of these demonstrations the agricultural public have been made acquainted with the wide range of devices which are available for mole and tile drains, for ditch making and cleaning, and for clearing water-ways. The preliminary report will deal with the mechanical and economic questions involved and will afford guidance as to the best and cheapest methods of performing the various operations. The economic aspect of the question is, however, one that cannot be speedily explored, since the efficiency of a drainage system over a series of years is the final test. An outstanding illustration is fur-

nished by the problem whether mole drains of 2½-in. bore at a depth of 18 in. are as efficacious as mole drains of 3½-in. bore at a depth of 2 ft. or more : not only are the rate of flow and the height of the water table in question, but the duration of the smaller, shallower drains as compared with deeper drains of approximately twice the cross section. Successful work has undoubtedly been accomplished with both systems, but no data as to the size of drains, their frequency and depth in given types of soil are available. Such data will need to be collected before a final report can be made, and the collection of information of this character must necessarily take time.

* * * * *

At the present time many claims are made on behalf of sub-soiling and special virtues are claimed for special systems. As

**Sub-Soiling
Investigations.**

readers of old agricultural periodicals well know similar claims have been made before; an impetus has been given to sub-soiling, mistakes have been made, and the movement has died down. What is remarkable is that no one has hitherto set himself to discover exactly what mechanical results were achieved in the soil and what the effect was on the chemistry of the soil and plant life. The first step clearly is to investigate various types of sub-soiling appliances and to observe the resulting crop. The Ministry has made a commencement with this investigation and a report upon some mechanical results, illustrated by photographs of very considerable interest, will appear in an early issue of the *Journal*.

* * * * *

THE index numbers of prices of agricultural produce in England and Wales show that, on the whole, average prices during October

**The Agricultural
Index Number.**

were rather higher than in September, the increase compared with the corresponding month in the years 1911-13 being 57 per cent. in September and 59 per cent. in October. The following table shows the increase in agricultural prices generally in each month since January, 1921, the corresponding month in 1911-13 being taken as the basis of comparison in each case :—

Month.	Percentage Increase.		Month.	Percentage Increase.	
	1921	1922		1921	1922
January ...	... 183	... 75	July ...	... 112	... 72
February ...	... 167	... 79	August ...	... 131	... 67
March ...	... 150	... 77	September ...	... 116	... 57
April ...	... 149	... 70	October ...	... 86	... 59
May ...	... 119	... 71	November ...	... 79	
June ...	... 112	... 68	December ...	... 76	

The index numbers relating to cereals all show slight increases, but prices during October were still only 24 to 33 per cent. higher than in October, 1911-13.

Prices of fat cattle, although showing a slightly hardening tendency throughout October, were less than 50 per cent. above pre-war figures. Sheep and pigs also advanced slightly in value during the month, but the average prices over the whole month show very little difference from those of the previous month.

Eggs rose sharply, and as the rise was greater than normally occurs between September and October, the index number also shows a rise, being now more than 100 per cent. above the pre-war figure. It seems fairly certain that egg production is at present one of the most remunerative forms of farming, although it does not bulk largely in the farmers' total receipts. With the exception of geese, which showed a slight advance, poultry was cheaper in October than in September. Both butter and cheese maintained their value, but with the average price in October, 1911-13, showing a substantial advance, the index number for last month shows a decline in each case.

The following table shows the average increase during recent months in the value of the principal commodities sold by the farmer :—

PERCENTAGE INCREASE AS COMPARED WITH THE AVERAGE PRICES RULING IN THE CORRESPONDING MONTHS OF 1911-13.

		May.	June.	July.	Aug.	Sept.	Oct.
Wheat	...	62	60	53	53	23	24
Barley	...	49	58	49	48	26	29
Oats	...	53	57	55	59	31	33
Fat cattle	...	70	71	70	70	58	49
Fat sheep	...	140	121	107	103	90	90
Fat pigs	...	91	82	91	92	84	85
Dairy cows	...	66	64	64	67	63	69
Store cattle	...	38	40	39	42	33	30
Store sheep	...	100	88	108	114	109	106
Store pigs	...	97	97	115	128	125	135
Eggs	...	50	69	80	64	96	104
Poultry	...	110	116	103	85	85	77
Milk	...	27	28	53	70	70	90
Butter	...	54	59	79	77	76	71
Cheese	...	48	55	50	51	41	36
Potatoes	...	140	80	75	14	1	3
Hay	...	33	35	37	54	52	45

The principal cause of the rise in the general index number in October was the increase in the price of milk, which in September was about 70 per cent. above the price in the corresponding month before the War, and in October rose to 90 per cent. above. As dairy cows are purchasable at about 70 per cent., feeding stuffs at less than 50 per cent., and labour at between 80 and

90 per cent. above pre-war prices, the dairy farmers' position would appear to be not unsatisfactory.

The average price of potatoes remained practically unchanged in October compared with September, but as the October price in 1911-13 was rather lower than that for September, the index number shows a slight rise. Hay fell slightly in value, owing principally to the marketing of this season's hay crop; the fall, however, is less than would at first sight appear from the index numbers, as a seasonal advance in prices is usual at this time of the year.

It is evident that in the present agricultural crisis the arable farmer is the greatest sufferer, for combined with his reduced prices he has had to contend with an expensive harvest and poor yields, except in the case of potatoes. Dairying is much more attractive, and the bright outlook for trade in sheep and pigs is reflected in the demand for, and high relative prices of store sheep and swine. Store cattle have been purchasable since the spring of this year at 30 to 40 per cent. above pre-war rates, and with feeding stuffs also obtainable at relatively low prices, even the fattening of cattle would appear to be not unremunerative.

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As from 1st January next, when the Corn Sales Act of 1921 comes into force, there should be an end of the varying weights

**Corn Sales Act,
1921.**

and measures by which corn and agricultural seeds are bought and sold in this country. For many years the different weights recognised in different districts as equivalent to a quarter or bushel of corn and other agricultural produce have been a source of much confusion, and the Act provides for greater uniformity in the weights and measures used in dealings in these articles. As will be seen from the definition section which is set out below the Act applies not only to corn but also to meal, bran, potatoes and agricultural seeds, and after the end of the present year any contract, bargain, sale or dealing in any of the articles to which the Act applies will be null and void unless it is made by weight only and in terms of, or by reference to, the hundredweight of 112 lb. This means that a contract, bargain, sale or dealing which does not conform with the provisions of the Act cannot be enforced in a court of law. It therefore behoves everyone trading in these articles to see that on and from 1st January next, all his

transactions in them are based on a price per hundredweight. There are some exceptions to the Act which are set out in full below, but so far as home-grown crops are concerned, the main exceptions, apart from sales for export, are dealings in growing and unthreshed crops. As regards articles produced outside the United Kingdom, the Act does not apply to dealings in them before they have arrived in the United Kingdom, nor does it apply to imported articles so long as they remain in the warehouse, store or shed where they were first stored on importation. The Act is also not applicable to cases where the contract, sale, etc., provides for delivery in the original bags in which the articles were imported (subject only to rebagging in replacement of damaged bags). So far as the farmer is concerned, therefore, these exceptions as regards imported produce would seldom apply.

The relevant sections of the Act are given below in full :—

Section 1. From and after the commencement of this Act, every contract, bargain, sale or dealing relating to corn shall, unless it is made or had by weight only and in terms of and by reference to the hundredweight of one hundred and twelve imperial standard pounds, be null and void.

Provided that this Act shall not apply to any contract, bargain, sale or dealing—

- (i) for or relating to a less quantity of corn than one hundred and twelve imperial standard pounds ;
- (ii) for or relating to corn which at the date of the contract, bargain, sale or dealing is not within the United Kingdom, or to corn imported into the United Kingdom so long as the same shall remain in the warehouse, or store, or shed where the same shall have been first stored on importation ;
- (iii) for or relating to corn imported into the United Kingdom in cases where such contract, bargain, sale, or dealing provides for delivery in the original bags in which the corn was imported (subject only to rebagging in replacement of damaged bags) ;
- (iv) for or relating to corn bought or sold for export from the United Kingdom ;
- (v) for or relating to corn growing on or in the land or to corn unthreshed.

Section 6. In this Act the expression “corn” shall, where the context permits, include wheat, barley, oats, rye, maize and the meal and bran derived therefrom, and any mixture thereof, and this Act shall apply to dried peas, dried beans, linseed and potatoes, and to the seed of grass, clover, vetches, swedes, field turnips, rape, field cabbages, field kale, field kohl-rabi, mangels, beet and sugar-beet, flax, and sainfoin in like manner as it applies to corn.

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HOME-GROWN CORN AND POTATOES FOR LIVE STOCK.

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UNDER normal conditions farmers grow their wheat and barley for sale to the miller and the maltster, and their potatoes for the market. Conditions this year, however, are far from normal, and everyone should consider whether it will pay him best to sell his corn and potatoes or to use them for feeding live stock.

This is a point which it is by no means easy to decide, as so many things must be taken into consideration. It is necessary to know not only the relative food and manurial values and the relative prices of similar feeding stuffs, but the price at which it is possible to buy suitable animals to be fed, and even perhaps in some cases, after two disastrous years, whether it might not ease the situation to sell corn and potatoes for ready cash and to buy even dearer feeding stuffs on credit.

It is impossible to deal here with such economic considerations, which must be decided by each farmer for himself. It is possible, however, to consider the relative feeding value of home-grown and purchased feeding stuffs, and to work out prices at which, other things being equal, it is cheaper to consume corn and potatoes at home than to sell them and to buy other feeding stuffs.

Even this is not quite straightforward, for the comparison should be made, not on price per ton, but on price per unit of nutritive value after making due allowance for manurial value. The best unit of nutritive value to select for this purpose is one hundredth of a ton of what is known as starch equivalent or net digestible energy.

Wheat, barley, oats, and potatoes are all somewhat similar in composition. All of them are characterised by the high proportion of starch which they contain. On the farm they could, therefore, be used to take the place of other feeding stuffs rich in starch, as, for example, middlings and maize. It is with these feeding stuffs that they should be compared.

Feeding Value of Middlings and Maize.—A ton of middlings contains 68 units of starch equivalent. The present price per ton is round about £8 and the manurial value is £1 7s. Deducting the manurial value, the net cost of the 68 units of starch

equivalent is £6 13s. The cost per unit of starch equivalent is therefore £6 13s. divided by 68, or almost exactly 2s. per unit.

The average price of maize at present is round about £2 per quarter, which is equivalent to £9 6s. 8d. per ton. Maize contains 81 units of starch equivalent per ton and its manurial value is 17s. per ton. The net cost of the 81 units of starch equivalent is therefore £8 9s. 8d. The cost per unit of starch equivalent is therefore £8 9s. 8d. divided by 81, or almost exactly 2s.

Starch equivalent costs 2s. per unit in both middlings and maize, the two starchy foods most largely used.

Feeding Value of Home-Grown Corn.—Average samples of sound wheat contain 72 units of starch equivalent per ton. At the present price of starch equivalent in maize and middlings, namely, 2s. per unit, the 72 units in 1 ton of wheat are worth £7 4s. Adding the manurial value of £1 per ton, wheat for home consumption should be worth £8 4s. per ton, or 37s. per quarter of 504 lb. This means that any farmer who owns suitable live stock to consume wheat, and is not in urgent need of ready cash, would be well advised to grind or crush his wheat for home consumption rather than to buy maize or middlings unless he could sell his wheat for considerably more than 37s. per quarter so as to pay for the delivery of the wheat and the carriage of other feeding stuffs bought in its place.

The following table gives the price below which it is more economical to keep corn and potatoes for home consumption rather than to sell them and buy maize or middlings at current prices :—

Wheat	...	37/-	per quarter of 504 lb.	} plus in each case an addition sufficient to pay for the cost of delivering the articles sold and fetching home the feeding stuffs bought in their place.
Rye	...	37/-	" " " 504 lb.	
Barley	...	32/-	" " " 448 lb.	
Oats	...	21/-	" " " 336 lb.	
Potatoes	...	40/-	per ton	

Having arrived at the prices which determine the relative economy of sale or home consumption, the next point is to discuss the use of the various articles in case it is decided to feed them at home.

Wheat.—It is commonly accepted that wheat is not a safe food for horses, and its use is not recommended for sheep. It can, however, be used successfully for pigs and for dairy cows.

For young pigs it may be used up to about one-quarter of their total ration, and it may be given either roughly ground together with the rest of the ration in the dry state, or more finely ground and made into slop.

For fattening hogs wheat may be used up to one-third of **their** total ration, and in this case it should be fairly finely ground together with the rest of the ration and made into slop.

For milch cows, ground wheat may form as much as one quarter of their total ration of concentrated food. Thus, supposing the ration consists of roots or silage, hay or straw, and 8 lb. of concentrated foods, the concentrated foods may consist of 6 lb. of cake and 2 lb. of ground wheat. In this case the ground wheat is usually mixed with the chaff and pulped roots and allowed to stand some time before feeding. This method of feeding prevents the wheat becoming pasty in the mouth.

Rye on the whole is not of good repute as a feeding stuff in this country. It can, however, be used successfully for pigs in the same way as wheat, provided the ration contains a little fish-meal or dried blood to supply constituents in which the rye is deficient. Skim milk or whey would also provide these absent constituents, or they could be supplied in the form of fresh roots or green-stuff.

Barley is much better known as a feeding stuff for live stock than either wheat or rye; in fact, the annual consumption of barley by live stock in the United Kingdom is not far short of a million tons. It can be used safely and economically for almost all kinds of stock except suckling sows and ewes and milch cows. The general opinion of practical stock keepers is that the use of barley for milking animals of any kind very soon produces a fall in the milk flow.

In the Eastern Counties, where the climate is too hot for the oat crop, barley is the standard horse corn. If used for horses it should be remembered that about 6 lb. of barley contain as much nutritive value as 7 lb. of oats, and in replacing part of the oats in a ration by barley, the replacement should be in these proportions, that is to say, 14 oz. of barley for 1 lb. of oats.

For fattening sheep barley is an excellent food, but when the sheep are on roots, which are poor in protein, the barley should be mixed with some other concentrated feeding stuff rich in that constituent. A series of trials carried out years ago by the Norfolk Chamber of Agriculture showed that by far the best addition to barley is decorticated cotton cake. For three years in succession a mixture of equal weights of crushed barley and decorticated cotton cake produced more mutton at less cost than any other mixture included in the trial.

Barley is also an excellent feeding stuff for pigs, except suckling sows. For fattening hogs it is ground with maize and fed as slop with the addition of a small proportion of bean meal or ground linseed cake or some other feeding stuff rich in protein. A suitable mixture would be equal weights of barley and maize with about one-twentieth to one-tenth of their weight of bean meal or linseed cake.

For younger animals the barley may be crushed and fed dry, and may form nearly the whole of the ration provided the animals have access to roots or greenstuff.

Oats are so well known as a feeding stuff as hardly to need any description of their uses. It may, however, be worth remark that oats are much more valuable for working or milking animals or for stores than for fattening. In case it is found desirable to use oats for pigs, the following method may be found valuable: grind the oats and mix to a thin slop with water; stir well and pour through a coarse sack. The finer, more floury, portions of the grain will run through and the thin slop thus obtained, thickened somewhat with maize meal or barley meal or middlings, may be fed to young pigs or to fattening hogs. The husky portions left in the sack may be used for sows.

Potatoes are a wholesome food for any class of live stock, provided they do not form an excessive proportion of the ration. They can be used either raw or cooked, but only small quantities should be given in the raw state. The common method of using up potatoes which for any reason it is not possible to sell or to use for human consumption, is to cook them for pigs. In this form they can be used to replace part of the meal ration at the rate of 4 lb. of potatoes to 1 lb. of meal.

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WHEN SHOULD THE FARMER SELL HOME-GROWN FOODS?

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IN the course of the Farm Costings investigations carried on by the University of Leeds it has been observed that there is a growing tendency this year for the farmer to feed his grain to stock, rather than to sell it and purchase cakes and meals. Inquiries are also continually being made as to whether at pre-

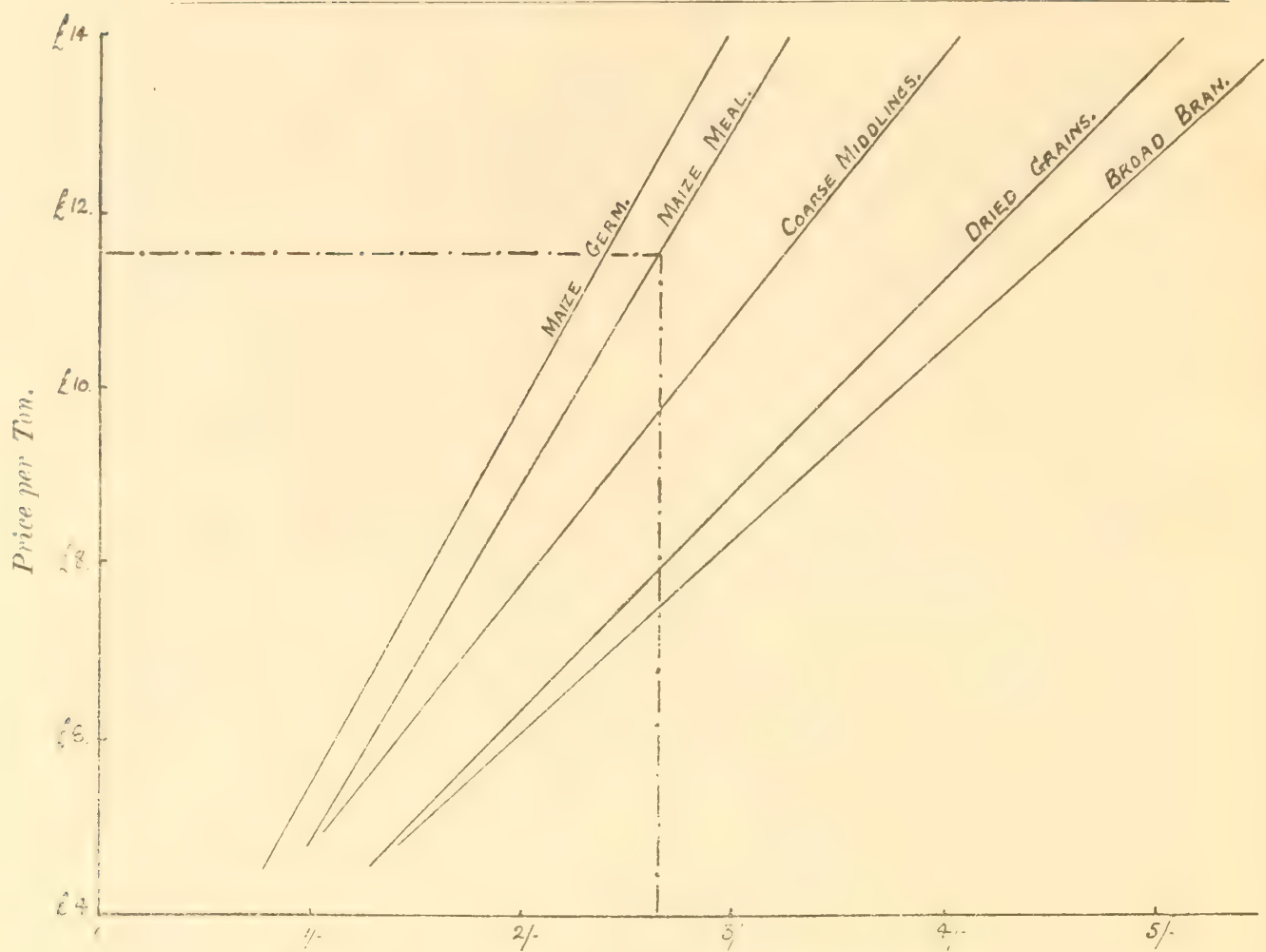


FIG. 1.—Purchased Foods (Carbohydrates).

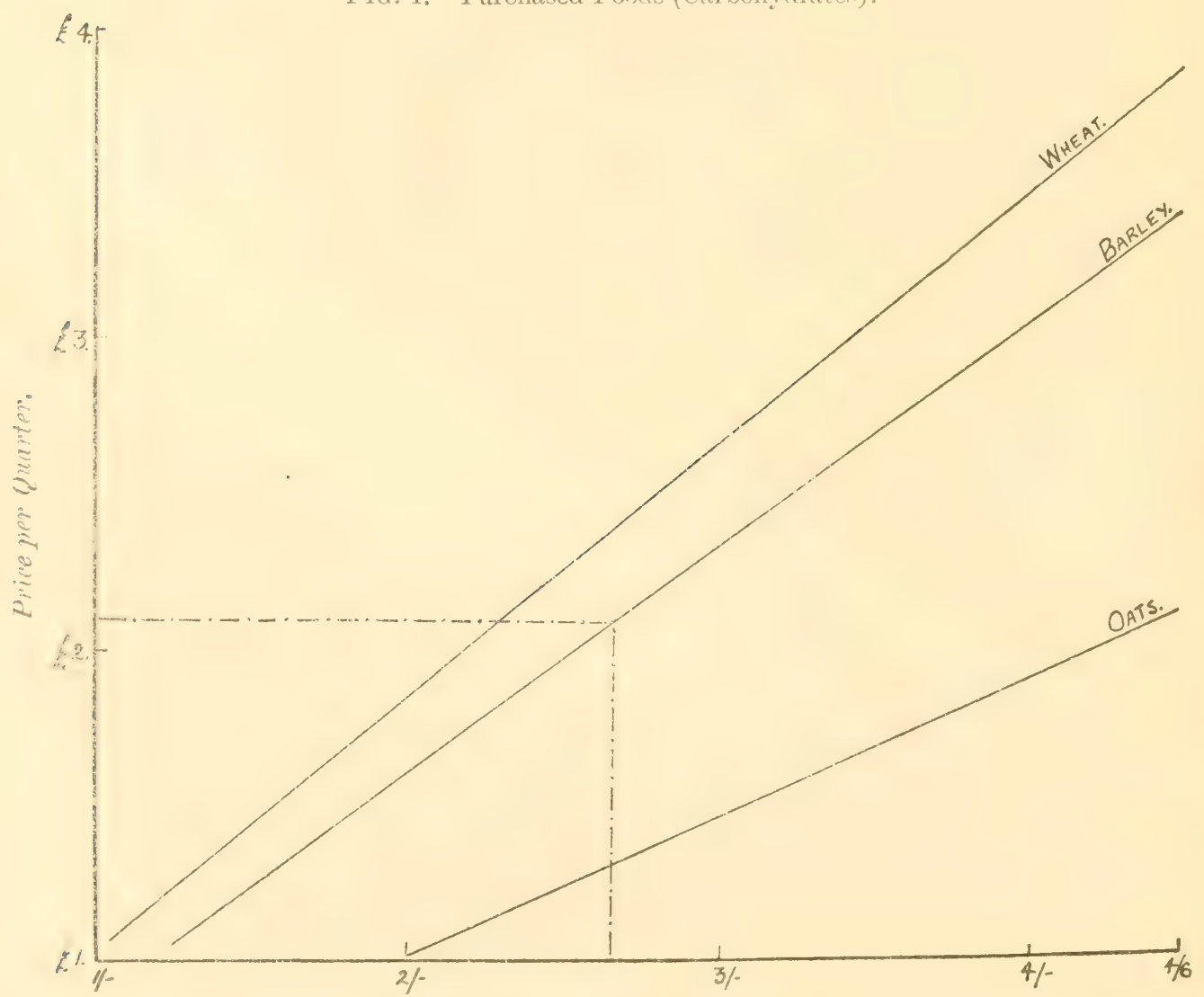


FIG. 2.—Home-grown Foods (Carbohydrates).

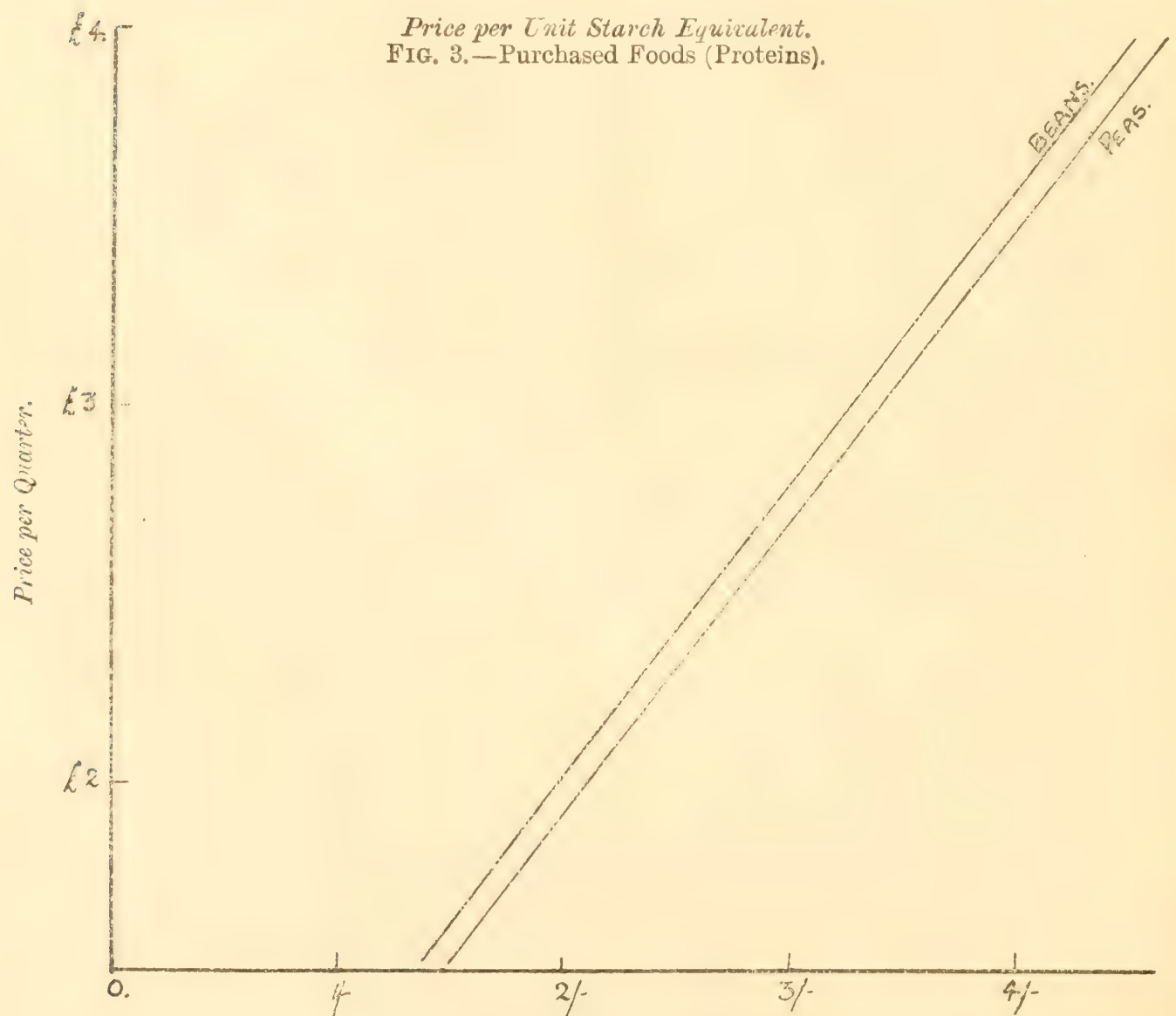
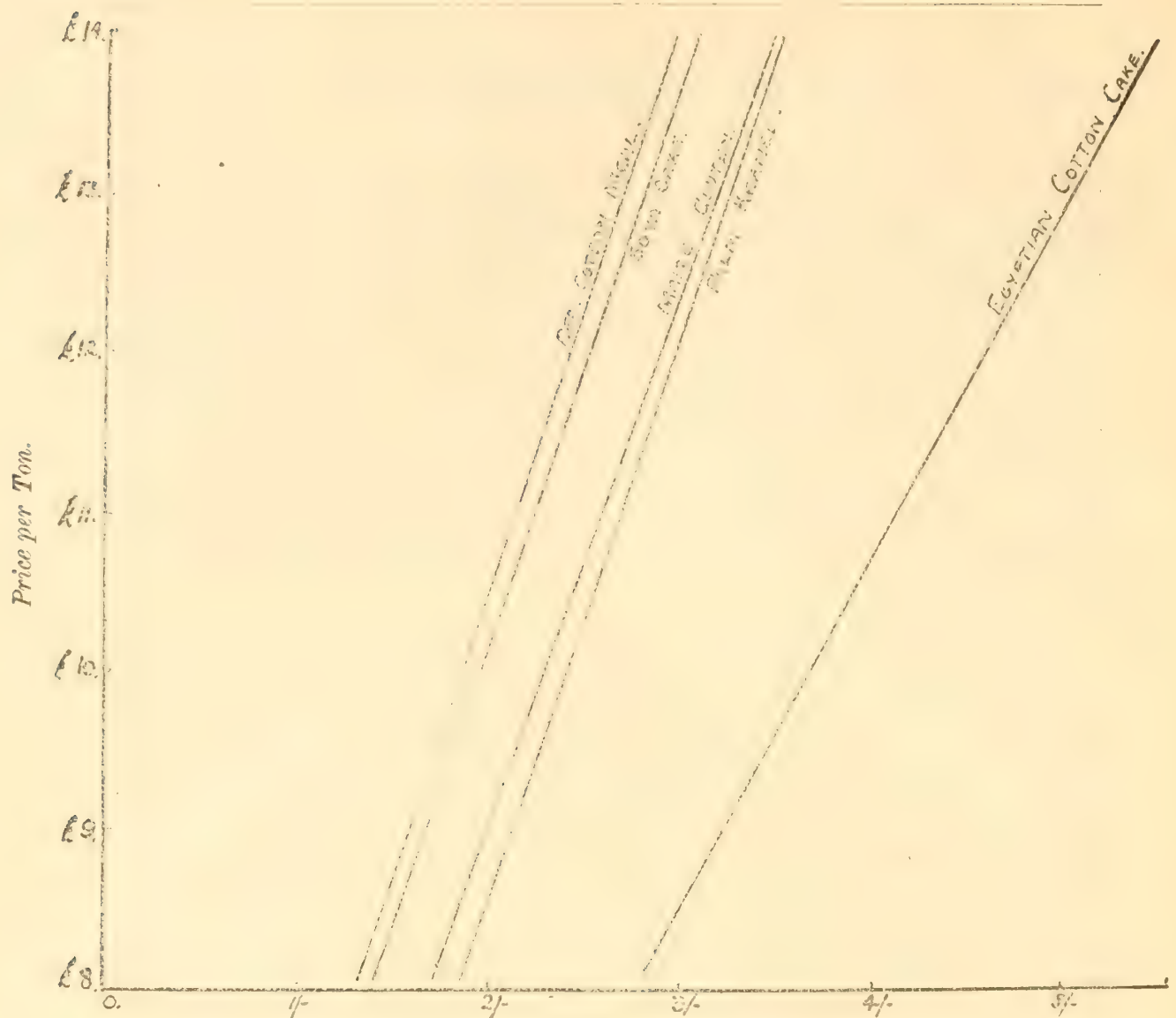
sent prices home-grown grain is a cheaper food than the usual purchased concentrates and as to what price these home-produced foods must reach before it will pay the producer to sell. A definite answer covering the whole range of purchased foods cannot be given straight away, owing to the large variation in their relative prices at any particular time. The possession of alternative markets is one of the economic advantages of the farming industry, and a study of the question "To Feed or Sell?" has brought out some interesting facts, which are here presented in the hope that they will prove of use to farmers all over the country.

Classification of Foods.—From the chemical point of view, wheat, oats and barley are carbohydrate foods, and can be used to substitute similar types of food normally purchased. No matter which type of carbohydrates is fed—either home-grown or purchased—protein also must be supplied to ensure the greatest possible utilisation of the food. The following list, abstracted from the feeding records of some 50 farms, includes those carbohydrate foods normally purchased: Maize germ meal, maize meal, middlings, dried grains, bran. Which, if any, of these can be replaced by home-grown grains, so as to reduce the cost of a ration?

Basis of Valuation.—As foods—even those in the same class, e.g., carbohydrates—possess different values to the animal, and as they also possess different manurial values, price per ton cannot be taken as a basis of comparison. It is, however, perfectly fair to compare foods of the same class on their price per unit starch equivalent, to determine which is a simple matter.

Methods of Calculation.—If from the price per ton the manurial value of the food in question be deducted the result is the feeding value per ton. When this is divided by the starch equivalent of the food—a figure originally proposed by Kellner and now incorporated in most standard tables of the composition of foods—the result is the price per unit starch equivalent. This is shown in the following example:—

<i>Sharps.</i>			<i>(Starch Equivalent 63 per 100 lb.)</i>	
Price per ton	...	...	£9	10 0
Less Manurial Value	...	...	1	14 0
Feeding Value	...	...	£7	16 0
Divide feeding value by Starch Equivalent (63)				
Price per Unit Starch Equivalent...			2s. 6d.	



Simple though this calculation be, it is realised that not all farmers possess the necessary tables—or the time, to work out the unit cost for all the foods they may be offered. To eliminate the arithmetic, the accompanying diagrams have been devised.

To avoid confusion in using the diagrams only five foods are shown in Figs. 1 and 3. Similar curves could, of course, be constructed for any food in which a farmer is particularly interested, the necessary data being obtained from suitable tables.*

Method of Using the Diagrams.—The diagrams show at a glance the price per unit starch equivalent corresponding to any price per ton of a foodstuff, or per quarter of grain. To take a concrete case, a farmer has some barley and considers whether to feed it, or to sell it and buy maize meal for his cows. He is offered 35s. per quarter for his barley and can buy maize meal at £11 per ton. Selling his barley involves carting to a station or mill or elsewhere, so the grain really stands him at less than 35s. on the farm, while against this has to be put the cost of grinding should he feed it. On the other hand, railway carriage and carting would increase the cost of the maize meal, and £11 10s. could be fairly taken as its cost on the farm.

Taking Fig. 1 he looks up the vertical line, until he sees the position corresponding to £11 10s. He then runs his pencil horizontally across to the line marked “Maize Meal,” and from the point of intersection draws his pencil vertically downwards to the horizontal line. The point at which this horizontal line is touched represents the price per unit starch equivalent of the maize meal.

He now turns to Fig. 2 and reverses the process. On the horizontal line he finds the point representing the same price per unit starch equivalent as the maize meal would cost. He then moves his pencil vertically until it meets the line marked “Barley,” and from there moves horizontally and to the left until his pencil crosses the vertical line representing “Price per Quarter.” If the price offered is less than that indicated by the diagram, it will pay the farmer to feed his barley, but if, on the other hand, the price offered is higher, then he should by all means sell and buy maize meal for his cows.

* (1) Pamphlet No. 73, published by the University of Leeds, which can be obtained free on application to The Department of Agriculture, University, Leeds.

(2) Miscellaneous Publication No. 32, published by the Ministry, price 6d.

(3) The table on p. 841 of this *Journal*.

(4) *The Agricultural Market Report*, issued weekly by the Ministry, price 2d.

To make this example clearer, the lines which the farmer draws, have been dotted in. They show that maize meal at £11 10s. per ton is costing 2s. 8d. per unit starch equivalent, and that valued on this figure barley is worth as a food £2 2s. per quarter. As, then, the farmer is offered only 35s. per quarter for his barley, it will pay him to feed it, and to continue feeding it until the price offered rises above 42s. per quarter.

It will be found that with a little practice the drawing of lines can be dispensed with, and the whole process will be quickly completed—in much less time than this description takes to read. The diagrams, of course, will hold for any year and any number of examples can be worked from them.

Protein Foods.—Not all farmers grow protein-containing foods in their usual rotations but those who have either peas or beans on hand should consider whether to feed or to sell and buy such protein foods as cotton cake and meal, maize gluten feed, palm kernel or soya bean cake. Figs. 3 and 4 can be used to determine this point, the same method being employed as when comparing the purchased and home-grown foods of a carbohydrate nature in Figs. 1 and 2.

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THE COMPETITIVE EXHIBITS AT THE SECOND IMPERIAL FRUIT SHOW.

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THERE were many at the close of the 1921 Fruit Show who, whilst recognising the advantage gained to the industry by the show, recommended that a lapse of five years should be given before holding a second. They admitted the success of the venture but thought that many had given support because of the novelty of the venture, which support, they feared, would not be forthcoming for a second show if held without an interval. Certainly the holding of a second show under much the same conditions and at the same place (Crystal Palace) was a bold venture; but that it was justified is shown by the number of entries received for competition at the show, which were as follows :—

Apples	...	...	...	...	...	1,081 entries.
Pears ...	...	...	...	...	...	107 „
Oranges	...	...	...	...	...	15 „
Grapes	...	...	...	...	...	15 „
Tomatoes	...	...	...	...	...	62 „
Potatoes	...	...	...	...	...	486 „
Total	...	...	...	...	...	<u>1,766</u> „

The display of such a large mass of fruit and potatoes was naturally an attractive sight to the many visitors who came to the Palace, and should have some effect in encouraging an increased consumption of fruit by townsfolk. The growers from all parts of England visited the show for another purpose, namely, to see the exhibits in the hope of learning better methods of selecting and packing the fruit for the markets. In this they were not disappointed, for there was much to be learnt by a close study of the methods adopted in selecting the fruit and the methods of packing adopted in the competitive exhibits; useful knowledge on market packages and methods of packing was provided at many of the trade exhibitors' stalls, whilst on the stands of the Ministry the scientific exhibits staged by the Long Ashton, East Malling, Rothamsted, Cambridge and Leeds University Research Stations, together with the models of pests from the Ministry's Pathological Laboratory, afforded a unique opportunity for all to acquire a knowledge of recent research.

The names of the apples were generally attached to each exhibit, so providing information for the less experienced. The Judges' Score Cards were also placed on view, not only that each exhibitor could see the marks awarded to his own exhibit but that all who so desired could study the good and weak points of every exhibit. The writer does not intend to give a general account of the show, for this the technical trade Press has provided, but it may serve a useful purpose to give a few notes on the winning exhibits in the premier classes, commencing with the all-important section where British and Canadian fruits were in competition.

Apples.—*British Empire Section.*—The principal classes in this section were for dessert and culinary apples, and each competitor's exhibit comprised no fewer than 20 boxes. In years favourable to the production of good samples of fruit the selection by a grower of some 4,000 dessert apples or 2,000 cookers, uniform in size, colour and shape, sufficient to fill 20 boxes, is by no means an easy task. This year when British fruit generally was small and of poor colour the task was a hard one, and it would generally be agreed that the British exhibits in this section fell below the high standard achieved in the Kent and Southern Counties and the West Midland Sections, where an exhibit comprised 6 boxes. The Canadian exhibits, though perhaps not so well packed as in 1921, contained good conditioned fruit with plenty of colour and bloom and of uniform size and colour.

In the *dessert* class the Canadian Cox's Orange Pippin, the MacIntosh Red, and Snows competed against the British Cox's Orange Pippin, Worcester Pearmain and Allington Pippin. The first prize was awarded to a good sample of Cox's from Nova Scotia. These apples, which were of medium size and packed 3×2 on end, bore a light crimson blush with broken streaks on a bright orange yellow skin, though showing little russet. The flavour, for which it scored full marks, was one of the best. Nova Scotia certainly seems able to produce apples of the best colour and with full flavour.

The second prize went to a fine dessert sample of Snows with clear skin lightly coloured red. Two English samples of Cox's Orange Pippin came next: with the exhibit from Malvern winning by one mark after appeal to the umpire. These exhibits were both excellent, but lacked the colour and brightness of the Nova Scotia apples.

Many other exhibits in this section were excellent, though some were on the small size. Two fine exhibits—Worcesters from Reading and Cox's Orange Pippin from Kent—were disqualified because the exhibitors did not comply with the rules.

For *culinary* apples the Canadians relied mainly on Kings, Greenings and Spy, and the English on Newton Wonders, of which many fine apples were shown, Lane's Prince Albert, and Bramleys. Exhibits of Bismarck and Gascoygne's Scarlet were included. Some bright red Nova Scotia Kings looked attractive and won the first prize. These were very evenly sized and uniformly coloured, but lacked quality. The exhibit of Bismarck from Chelmsford secured the second award, with Newton Wonder—rather on the small size—from Canterbury, third.

There were some very good Bramley's Seedling apples, but this variety does not show to advantage in boxes. Newton Wonder and Lane's Prince Albert on the other hand, looked well in boxes—the bright scarlet flush of the former and the red stripes of the latter showing to advantage. There was one specially fine exhibit of Lane's, which was disqualified by the Judges as the pack did not conform to the rules, being “off-set.”

All the winning apples were packed 2×2 which may serve as an indication as to the size for future selection of cooking apples.

Pears.—In the Channel Islands and the Great Britain sections there were many different varieties of pears, of which Doyenné du Comice, Conférence, Durondeau, Calebash, Louise Bonne, Marie Louise, Emile D'Heyst, Pitmaston

Duchess and Catillac were the more prominent. In some exhibits the pears were packed either in cotton or wood wool; in others they were wrapped in paper and packed in boxes in a manner similar to that adopted for apples. Where care in packing had been given both methods proved satisfactory, though generally the packing of pears was at fault and contrasts of the packing provided an excellent object lesson to those willing to learn by observation.

The Conférence section was strongly contested, but the standard was low as would be expected for Conférence at this late date.

In the Great Britain section there was one exhibit from Sussex of exceptionally large, fine quality Doyenné du Comice, which lost the first prize solely through bad packing. The first prize was awarded to an exhibit from Kent of much smaller pears, of even size and colour and excellently packed. Generally this class was but slightly contested. The standard of fruit was high, but the packing poor. Much of the fruit rapidly deteriorated owing to bruising due to faulty packing, and prices by auction ruled low. The Doyenné du Comice in the Channel Islands section were on the whole better than in the Great Britain section. The fruits were larger, in better condition, and the best exhibits were carefully packed, the fruit being separated with protective paper. In many of the exhibits in this section the fruits were tumbled together instead of being nicely separated and kept in position by paper partitions. The Channel Islands fruit kept well and the well packed fruit realised quite good prices at the sale.

Pitmaston Duchess figured largely in the "any other dessert variety" class in both the Great Britain and the Channel Islands sections, and some excellent, large bright specimens were shown. The exhibits of Calebash and Durondeau were rough, the Louise Bonne small, attractive and nicely packed.

In the class for cooking pears, Catillac was shown in every instance except one, and this won the first prize. The second prize was awarded to an excellent and nicely coloured sample of Catillac from Faversham. The other samples of Catillac lacked uniformity and it was evident quality had been sacrificed to large size.

Grapes.—There were classes for grapes in the British Empire section, the Great Britain section and the Channel Islands section, but only in the last were there any material entries. Generally Muscat of Alexandria was shown in the classes for white grapes and Colmar as blacks. All exhibits were good, the

bunches were of large size and contained good even sized berries in excellent condition and full of bloom.

The bunches of grapes were tied to shallow baskets which were lined with white paper, wood, or cotton wool, depending on the method adopted. The grapes in every single instance when packed in this way had travelled well, retaining most of the natural bloom and freshness, and were generally admired by the public.

It was difficult to decide as to the best exhibit in the show; some of the public preferred the waving exhibit of Colmar shown by Mr. Tostevin, Guernsey, in the Channel Islands section; while others thought the Colmars of Messrs. Douglas Brothers, of Worthing, which secured the first prize in the Great Britain section, superior. Both were good and at the auction sale each realised 12s. per basket.

The Dominion of Canada has cause to be proud of its successes attained at the present show, and the State of Nova Scotia by securing the two first prizes has abundantly demonstrated the capabilities of that State for producing apples of the highest class. In the Section confined to Overseas eleven of the possible fourteen first prizes were secured by Ontario, which must rank as a great performance. Channel Island exhibitors were showing for the first time and they have every reason to be satisfied with the produce shown and the success achieved.

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ELECTRO-CULTURE.

ALTHOUGH investigations into the influence of electrical discharge on plant growth are still in the preliminary stages and the economic possibilities of "electro-culture" are still uncertain, so much interest has been manifested in the subject that it is desirable to give a brief account of the work so far accomplished under the direction of the Electro-Culture Committee.*

* The Committee was appointed in 1918, to "advise the Ministry of Agriculture and Fisheries in regard to all electrical questions in connection with the carrying out of experiments in electro-culture, and particularly in regard to the construction of apparatus suitable for use on an economic scale, and to the making of such electrical measurements as may be necessary in connection with the experiments." The present constitution of the Committee is as follows:—Sir John Snell, M.Inst.C.E. (Chairman); Mr. A. F. Berry; Professor V. H. Blackman, F.R.S.; Mr. A. B. Bruce, M.A.; Dr. C. Chree, F.R.S.; Mr. W. R. Cooper, M.A., B.Sc., A.I.C.; Dr. W. H. Eccles, F.R.S., M.I.E.E.; Mr. P. Hedworth Foulkes, B.Sc.; Mr. J. S. Highfield, M.I.E.E.; Professor G. W. O. Howe; Professor T. Mather, F.R.S., M.I.E.E.; Mr. B. J. Owen, M.Sc., M.Eng.; Mr. H. G. Richardson, M.A., B.Sc.; Sir John Russell, F.R.S.; and Mr. C. T. R. Wilson, F.R.S.

The scientific aspect of the work will be more fully dealt with in two papers which Prof. V. H. Blackman is contributing to the "Journal of Agricultural Science." The Committee has now been at work for five years and has issued four interim reports*: the work completed in 1922 which was undertaken on lines suggested by the experience of previous years promises very striking results, but an account of that work must await the fifth interim report of the Committee which has not yet been presented.

In view of the complexity of the subject the Committee have confined their experiments to electro-culture by means of overhead discharge. Field experiments have been carried out for the Committee by Professor V. H. Blackman at Rothamsted with barley (1918 and 1920), winter sown wheat (1919 and 1920), winter oats (1921) and clover hay (1919, 1920 and 1921); at Lincluden (Dumfries) with oats (1918, 1919 and 1920), and potatoes (1921); and at Harper Adams Agricultural College with oats (1919, 1920 and 1921), clover hay (1920) and pea and oat mixtures (1921). Pot-culture experiments have been carried out by Professor Blackman at Rothamsted in 1918, 1919, 1920 and 1921, with wheat, maize and barley; laboratory experiments to determine the effect of electric currents on the growth of plant organs have also been undertaken.

Field Trials.—Apparatus.—The apparatus at Lincluden consisted of a mercury interrupter, supplied with a direct current at a voltage of 60, an induction coil and three Lodge valves in series. At Rothamsted it consisted of a petrol-driven "Delco" set, with at first a dry transformer and later an oil-cooled transformer, and a Newton and Wright disc-rectifier. At the Harper Adams Agricultural College current (100 volts D.C.) was available from the small electric lighting installation of the College. The apparatus consisted of a 2-h.p. motor coupled to a one K.V.A. A.C. generator (140 volts) which bore on an extension of its spindle a Newton and Wright disc-rectifier. An oil-cooled transformer (1-K.V.A.) giving a voltage up to 60,000 was employed for the discharge current.

Field Installation.—A steel cable supported on high tension insulators was fixed at a height of about 7 ft. at each side of the electrified areas and fine galvanised steel wires (gauge 29) spanned the distance between the cables. The wires were 5 or 10 ft. apart. The aerial installation was made positive.

* To be obtained free on application to the Secretary to the Committee, Mr. W. R. Black, B.Sc., Ministry of Agriculture, 10, Whitehall Place, S.W. 1.

At Harper Adams Agricultural College a screen of wire-netting, 8 ft. high was fixed between the electrified area and the control area during one season's experiments.

Current.—The currents varied at the different stations with different crops, and in the different years. Those in 1921 were as follows:—At Lincluden, the discharge was given at the rate of about 0.5 milliamp. per acre; the voltage (crest value) was about 25,000. At Rothamsted two installations were supplied from the same transformer, so that the current could be controlled in one only, that over winter oats being selected. With this crop the voltage (crest value) varied between 25,000 and 55,000 and the total discharge current was maintained at the rate of 0.5 milliamp. per acre. The discharge given to the clover grass varied from 0.2 milliamp. to 0.6 milliamp. per acre. At Harper Adams Agricultural College also two installations were supplied from the same transformer. With oats the voltage (crest value) varied from 25,000 to 56,000, and the current was kept at about 1.0 milliamp. With the pea and oat mixture the current varied between 0.25 and 1.25 milliamp. per acre.

Period of Discharge.—The periods during which crops were subjected to the overhead discharge varied from 500 to about 900 hours. As a rule the period lasted from April to August and the discharge was continued for 6 or 8 hours daily.

Results of Field Experiments.—The results from different crops in different years and at different stations are fully discussed in the four Interim Reports which should be consulted for details. The accompanying table, however, gives a general summary of results of field experiments from 1915 onwards (those from 1918 being under the auspices of the Committee). This summary does not include results obtained in 1921, the dry weather of that year being unfavourable for field experimental work.

The data taken as a whole show that of the fourteen *positive* results of experiments extending over six years only three are less than 10 per cent., while of the four *negative* results none reaches 10 per cent. Of the ten positive results with spring-sown cereals only two are less than 10 per cent., and six show an increase of 30 per cent. or over; while of the two negative results both show decreases of less than 10 per cent. The results of field experiments with these spring crops show an average increase of 22 per cent. The effect of electrification in increasing the yield of spring-sown oats and barley has thus

been demonstrated. A beneficial effect on clover-hay is probable, while that on winter-sown wheat is still uncertain.

SPRING SOWN CEREALS.

*Difference in Yield per
acre of Electrified Crops
compared with Control
Crops.*

							Actual.	Relative.
							Bush.	per cent.
Lincluden	...	...	1915	...	Oats	...	+ 4·8	+30
"	...	...	1916	...	"	...	+11·2	+49
"	...	...	1917	...	"	...	+ 0·7	+ 2
"	...	...	1918	...	"	...	+26·7	+50
"	...	...	1919	...	"	...	+12·8	+35
"	...	...	1920	...	"	...	— 2·6	— 6
"	...	...	1920	...	"	...	+18·8	+57
Rothamsted	...	...	1917	...	Barley	...	(+2·5)*	(+35)
(Small plots)								
"	...	...	1918	...	"	...	+ 4·4	+10
"	...	...	1920	...	"	...	+ 5·1	+19
Harper Adams College...			1919	...	Oats	...	+ 1·0	+ 2
"	"	...	1920	...	"	...	— 4·3	— 9
Mean							+ 7·1	+22

WINTER SOWN WHEAT.

							Bush.	per cent.
Rothamsted	...	...	1919	...	...	...	+ 6·0	+38
"	...	...	1920	...	...	...	— 0·7	— 4

CLOVER-HAY.

							Cwt.	per cent.
Rothamsted	...	...	1919	(1st Crop)	...	...	+11·7	+50
"	...	...	1919	(2nd Crop)	...	...	+ 4·3	+34
"	...	...	1920	...	...	...	+ 0·5	+ 2
Harper Adams College...			1920	...	...	...	— 3·0	— 6
Mean							+ 3·4	+20

Pot Culture Experiments.—The object of these experiments carried out at the Rothamsted Experimental Station has been to obtain various data as to the current to be used in electro-culture work on the early vegetative growth of cereals. The subjects investigated have been strength of current, the relative effects of direct and alternating current, and of upward and downward current and the period of the life of the grow-

* One result, that of the Rothamsted experiment of 1919 with wheat, has been excluded, for owing to special conditions the crop was a partial failure, yielding only 8 bushels to the acre. The decrease in yield of the electrified area as compared with the control was 7 per cent.

Also in calculating the differences in yield between the two areas, that of the Rothamsted barley plots of 1917 has not been included in determining the average, for the crop was harvested some time before maturity.

ing crop when the discharge is most effective. Wire networks charged to a high voltage (4,000-16,000 crest value) were suspended at various heights above the plants; the current passing through plants was led off from the bottom of the insulated pots to a micro-ammeter reading to 0.01 microamp. The networks were made positive, except for one set of experiments in 1921. The control pots were "earthed" in all cases.

In 1918 and 1919 the high tension discharge was obtained by the use of a mercury interrupter and an induction coil, Lodge valves being employed for rectification. In the experiments of 1920 and 1921 the installation consisted of a small rotary converter giving 70 volts A.C., and a wax-impregnated transformer made by Messrs. Newton and Wright. The overhead networks, when alternating current was used, were connected directly to the transformer; when direct current was required rectification was obtained by means of Lodge valves. The plants themselves were able to bring about some slight rectification.

The discharge in these pot experiments was usually given for about six hours each day. There were two experiments with wheat, nine with maize, and nine with barley.

In 1918 it was found that (under the conditions of the experiments) currents passing through the plants of the order 10×10^{-9} amp. were injurious in the case of the early vegetative stages of maize. Currents as low as 0.3×10^{-9} amps. appear to have an accelerating action on growth. The experiments of 1920 suggested that alternating current is as effective as direct current, if not more effective; the results obtained that year with direct current were, however, less satisfactory than in previous years.

The experiments of 1921 confirmed the results of 1920 that alternating current is usually as effective as, or more effective than, direct current. They further suggested that an upward current through the plant can increase growth in the same way as a downward current; and, lastly, they suggest that a discharge applied for the first month only of the growing season may be at least as effective as one continued throughout the growing season—a result, if confirmed, of great importance since it shows that the running costs of crop electrification can be markedly reduced.

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IMPROVEMENT OF MOORLAND GRAZING IN THE NORTH OF ENGLAND.*

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THE total area of land in Northumberland is over $1\frac{1}{4}$ million acres. Of this about 700,000 acres are under crops and grass, and there are about 500,000 acres of moorland pasture and rough mountain land in the county. The object of this article is to deal with the portions of the latter that are capable of economic improvement. Experiments on the improvement of moorland have been conducted for some years on several moorland farms, in the upper North Tyne, including Kielder (Mr. Thornton), Newton (Mr. John Robson), and at other centres. The results have been most suggestive, and indicate possible lines of improvement.

Trials near Bellingham, 1920.—In the autumn of 1919, Mr. Arthur H. Ridley, Park End, Wark-on-Tyne, offered to have an area of about $14\frac{1}{2}$ acres of moorland at Highfield farm, about 5 miles north of Tarsset Station, fenced off and treated with a suitable manure. This area is at about 800 ft. altitude. Part of it was under cultivation many years ago, while the remainder is virgin moorland and is typical of very large areas of such. It includes some dry moorland with a little heather and also land on which are growing rough grass and moorland plants.

Basic slag (38 per cent. phosphates) was applied at the rate of 10 cwt. per acre on most of this area in the early spring of 1920. A portion of the enclosure was left untreated, and to the north a portion of the unenclosed moor was treated with basic slag at the same rate per acre. Mr. Ridley has met the greater part of the cost (over £100) of this trial. The carting of the material and the application of the slag were done by the tenant.

When inspected in August, 1922, it was found that the part to the south-east, which was in cultivation many years ago, is not yet responding well to basic slag. The tops of the ridges have no clover plants, very wiry grass, and a good deal of dead organic matter on the surface, underneath which the soil is very dry. In the furrows, where there is more moisture, wild white clover is developing well and is slowly extending towards the

* See this *Journal*, January, 1921, p. 928.

crowns of the ridges. It is probable that a good effect would be produced by cuts with a disc harrow or by other means, made on the crowns and in the direction of the ridges, so as to allow rain water to penetrate to the soil. Grazing with cattle is being done and will help this tendency. The best clover development is on virgin moorland on the northern part of the enclosure, where the soil is near the surface and there is not much matty covering. Between the rushes in these parts clover plants are developing well, and this is also taking place immediately to the north on the unenclosed moor. Cattle are eating the herbage much better in the enclosed area than sheep are doing on the moor outside. On the west of the area the moorland is dry and harsh and here there is little result. It is evident, therefore, that this latter is not the kind of moorland on which improvement should be attempted.

The important lesson already derived is that there are only limited areas of moorland which can be profitably improved by basic slag or other phosphatic manures, and that the areas that can be so improved are those on which small clover plants can be found and where the soil is fairly near the surface. Soil of a loamy or heavier character is likely to respond to phosphatic manuring, but sandy moorland will probably not do so to anything like the same extent. Evidently a damp condition of the moor is a distinct advantage, provided the land is not waterlogged with stagnant (marshy) water. Where there is much dead organic matter on the surface the phosphatic manures cannot reach the soil underneath for many years, and there is little hope of improvement for a long time. Clover plants are usually absent on such areas.

Trials near Haltwhistle, 1920.—Alderman Sample has made similar trials at Whiteside, 4 miles north of Haltwhistle, at an altitude of about 700 ft. High grade basic slag (10 cwt. per acre) and mineral phosphates in equivalent quantities, applied in the winter of 1920-21, are already showing good results on moorland where the conditions are favourable, as at Highfield, but there is practically no response to these manures where the herbage is harsh and coarse in character, with no clover plants and a thick mat of organic matter.

The results were of the same character on Tipalt moor, adjoining Whiteside (Mr. Edward Joicey, Blenkinsop Hall, Haltwhistle); on the Paise farm, 4½ miles from Hexham (the late Mr. R. O. Blayney), and at Westburnhope farm, 9 miles south of Hexham (Mr. Edward Robson).

Grazing with Sheep and Cattle.—On moorland farms, grazing with cattle helps greatly in improving the herbage, as cattle eat far more of the stemmy herbage than sheep. At Cockle Park, where pasture of the poorest character has been effectively improved by basic slag, grazing with sheep alone gives gains of about 100 lb. live weight per acre during each grazing season, whereas when the plots are stocked with cattle and sheep about double this live weight increase is obtained. The plots grazed with sheep alone develop much stemmy herbage and clover development is checked, whereas grazing with cattle and sheep gives pasture with little stemmy herbage and a close and firm bottom of grass and clover plants.

Trials in Scotland.—Dr. Shirra Gibb, in 1906, reported on trials of basic slag, kainit and lime on hill grazings at twenty centres in Scotland.* The dressings per acre were, 5 cwt. slag, 10 cwt. ground lime, and $2\frac{1}{2}$ cwt. kainit. The slag and lime were applied on half acre plots and the kainit was applied as a cross dressing.

The conclusions drawn were that basic slag may be expected to do good on clay soils, with clay or tilly subsoils, which have small clover plants and poorly eaten grasses, and that in such cases kainit was not required. On moory, mossy and generally black topped land slag was evidently helpful, with probably in this case the addition of kainit. If the sod was very dense and the roots thick and matted it was doubtful if any manuring would pay.

Ploughing out Matty Turf.—Much of the old grass land ploughed out during the last years of the War had a thick matty covering on the surface. This covering is a common cause of poverty in moorland hay and grazing land and has been encouraged by grazing with sheep alone, or by continually mowing for hay, usually late in the autumn. The application of nitrogenous manures like sulphate of ammonia and nitrate of soda has tended to develop this matty covering, as such manures encourage the wiry grasses and check clover plants. On the Palace Leas meadow hay field at Cockle Park, sulphate of ammonia, applied continuously for over twenty years, has developed such a mat to a depth of over 3 in. of the same character as is to be found on much of our moorlands, whereas where basic slag alone has been regularly applied no such mat has been formed and the soil is close to the surface. In the former case the aftermath is of a harsh and wiry character which the grazing stock refuse to

* *Transactions of the Highland and Agricultural Society*, 1906, p. 80.

eat, thus leaving the wiry herbage to accumulate on the surface for years.

Where old grass land with a mat of this character has been ploughed out and, after one or two corn crops, or being put through a rotation, has been judiciously sown down with the right seeds mixture containing wild white clover, and treated with basic slag or other phosphatic manure, young pastures have resulted of a far greater value than the poor benty pasture which was ploughed out.

At three centres at least in Northumberland some moorland is now being ploughed out, the object being to bury matted turf and to bring soil to the surface. It is recommended that such ploughing be done early in the winter, with a disc coulter, to bury the turf as effectively as possible. Harrowing should be well done in spring with a disc harrow if possible. High grade basic slag at the rate of 10 cwt. per acre, or finely ground North African phosphates at the rate of $6\frac{1}{2}$ cwt. per acre* should be harrowed in, as well as sulphate of ammonia, $\frac{3}{4}$ cwt. per acre, to assist the oat crop. Old fashioned tillering oats, as the Sandy variety, may be sown at about 3 bushels an acre. A suitable seeds mixture should be sown immediately after. For this purpose the following seeds mixture per acre is suggested:—18 lb. perennial ryegrass, 8 lb. cocksfoot grass, 3 lb. red clover (preferably late flowering) and 1 lb. wild white clover. Care must be taken to get a firm seed bed with a good tilth on the surface. The oats should be mown green and made into hay, unless they promise to mature in good time. Success in this direction would provide on moorland farms hay and pasture of a most valuable character.

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* For particulars of these manures see this *Journal* for Sept., 1922, p. 519 ; Oct., 1922, p. 600 ; and Nov., 1922, p. 706.

LABOUR ON THE FARM.

II.

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[*The first part of this article in the November issue of the JOURNAL dealt with the influence of the War on the labour bill.*]

A REVIEW of the labour bill per acre on the farms of which the accounts were available, showed such large variations that an attempt was made to analyse the factors responsible for the variations.

Size of Farm.—The farms were grouped according to size and the average labour bill per acre was calculated, in an attempt to see if size of farm was a determining factor in the labour bill. Table V illustrates the results obtained.

TABLE V.—VARIATION OF LABOUR BILL WITH SIZE OF FARM.

Size of Farm, acres.		No. of Farms.		No. of Acres comprised.		Labour Bill per acre, 1921–1922.		
						£	s.	d.
0–50	...	3	...	96	...	10	4	10
50–100	...	4	...	300	...	3	12	11
100–150	...	4	...	504	...	3	17	11
150–200	...	5	...	863	...	3	0	0
200–250	...	3	..	642	...	4	0	2
250–300	...	3	...	784	...	1	17	7
Over 300	...	7	...	2,526	...	3	19	1

As was expected the labour bill per acre on holdings of less than 50 acres was much greater than that on larger farms. On the basis of size alone it is impossible to correlate the remaining figures, and consequently the influence of a second factor—the proportion of the farm under grass—was investigated.

Proportion of Grass.—The figures obtained are tabulated in Table VI.

TABLE VI.—VARIATION OF LABOUR BILL WITH PROPORTION OF GRASS.

Percentage of Farm under Grass.		No. of Farms.		Acres Comprised.		Labour Bill per acre.			Group.
						£	s.	d.	
0–20	...	2	...	336	...	6	3	5	1
21–40	...	8	...	1,545	...	3	0	7	2
41–60	...	7	...	1,754	...	4	2	3	3
61–80	...	5	...	1,110	...	2	12	4	4
81–100	...	4	...	608	...	3	19	0	5

The group of farms with the lowest proportion of grass land has the highest labour bill per acre. This was to be expected, but the reduction of 50 per cent. in the labour bill which occurs in the next group, was not anticipated. When the figures for the other groups, with a still higher proportion of grass land, are examined, it will be realised that the proportion of grass, although influencing the labour bill, is not by any means the only factor. The character of the farming undertaken on the farms in the last two groups supplied the reason for the labour bill figures. The farms in the last group are all grass land dairy farms where large milking herds are kept and milk is produced on highly intensive lines. Consequently the labour bill on these farms is high. The fourth group, on the other hand, is composed almost entirely of farms where either summer grazing of bullocks or the breeding of sheep is the main branch followed, and as the labour requirements of these classes of stock are small, the labour bill per acre is correspondingly low.

It would appear, therefore, that the amount of the labour bill on any particular farm, provided the labour is organised to the best advantage, is determined by the interaction of at least three factors :—

1. The size of the farm.
2. The proportion of the land under grass.
3. The system of farming adopted.

Of these, the third is probably the most important.

System of Farming Adopted.—On most of the farms which have been costed labour and time sheets have been kept from which it has been found possible to extract each year the number of days of manual, horse or tractor labour employed per acre of each individual crop, or field, or per head of each variety of stock. In Table VII are given the average results obtained on all farms costed from 1918 to 1922, while, for the sake of comparison the figures quoted by Bridges as obtained from an East Midlands farm in 1918 are also given.*

When it is remembered that the figures quoted by Bridges for the grain and pulse crops are exclusive of the necessary work for threshing and delivering, that on this East Midland farm of 965 acres a large amount of steam cultivation, with its accompanying comparatively small amount of manual labour, was carried out on much of the wheat, oats and barley, and that such operations as hedging, fencing, draining, ditching, road

* See this *Journal*, July, 1922, "Labour Organisation on an East Midlands Farm, by Archibald Bridges."

repairs, which we have allocated to the various crops, have in the other case been included in the overhead or establishment charges, it will be seen that the agreement between figures found for one year on one farm and those found on an average of approximately 20 farms for 4 years is closer than might have been expected. The big outstanding differences appear to be those found in the cases of the swedes and pasture.

Swedes on the East Midlands farm would probably have mostly been fed off by sheep, thus eliminating the cost of lifting, while in the case of the pasture the labour involved in the so-called establishment charges, which we have found to average from three-quarters to one day per acre, would readily account for the difference.

TABLE VII.—DISTRIBUTION OF MANUAL LABOUR.

				<i>Number of Days per acre.</i>		
				<i>Average of all Farms Costed, 1918-22.</i>		<i>East Midlands Farm, 1918.*</i>
<i>Roots :—</i>						
Carrots	...	...	...	56·0	...	61·4
Potatoes	...	...	...	34·1	...	33·8
Mangolds	...	...	...	23·7	...	16·7
Swedes	...	...	...	23·0	...	8·3
Soft Turnips	...	...	...	21·2	...	—
Rape and Kale	...	...	...	10·6	...	—
Cabbage	...	...	...	22·2	...	—
<i>Cereals :—</i>						
Wheat	...	...	...	8·7	...	4·3
Oats	...	...	...	8·0	...	4·3
Barley	...	...	...	7·7	...	4·6
Peas	...	...	...	10·6	...	7·7
Beans	...	...	...	8·2	...	4·0
Linseed	...	...	...	9·4	...	—
<i>Seeds :—</i>						
Mown	...	...	...	3·1	...	2·2
Grazed	...	...	...	1·3	...	0·7
<i>Meadow Hay</i>	...	...	...	2·5	...	2·1
<i>Forage Crops</i>	...	...	...	6·1	...	0·0
<i>Pasture</i>	...	...	...	0·9	...	0·1

Number of Days per head of Stock.

<i>Average of all Farms Costed, 1918-22.</i>					
Cows	...	...	...	...	24·5
Other Cattle	...	...	...	...	6·7
Pigs	...	...	...	...	2·8
Sheep	...	...	...	...	0·9

* This *Journal*, Vol. XXIX, No. 5, p. 450.

While the average figures only, as found by us, have been quoted, yet from farm to farm, and even from year to year, the amount of manual labour employed on any particular crop has been found to vary considerably with the season, the type of soil and the capability of the farmer as a manager. It is, however, quite evident that on an arable farm the man who concentrates on potatoes, carrots and possibly peas, will have a higher labour bill than one who concentrates on cereals; and the man who attempts to supply succulent food to his stock in the form of forage crops should have an advantage as far as labour bills are concerned over one who supplies it in the form of roots. On farm R.T.T., consisting of 304 acres of light land, 89 per cent. of which is arable, and on which 41 acres of potatoes, 10 acres of carrots and 15 acres of peas were grown last year, the labour bill amounted to £5 8s. 7d. per acre, as compared with £2 17s. 7d. on farm A.T.J., a farm with approximately the same proportion of arable land the texture of which rendered it typically wheat land.

On farms which may be looked upon as "grass land farms," the labour bill per acre is bound to vary according to the kind of stock that the grass land is carrying.

Thus on farm P.O.H. the wages bill amounted last year to £6 18s. per acre. Here 90 per cent. of the land is grass, but milk production on the intensive system is carried on.

On farm E.P.M., engaged in the breeding, rearing and fattening of cattle, the labour bill amounted to £2 9s. 9d. per acre, and on W.S.S., a similar farm, to £2 19s. 5d.

On farm W.J.C., a Dales farm of 321 acres, 76 per cent. of which is grass, though not altogether a sheep farm, yet one on which the farmer specialises in sheep, the labour bill amounted only to £1 10s. 9d. per acre.

Justification of Labour Bill.—If one were asked, "what labour bill per acre is a farmer justified in having at the present time?" no definite answer could be given. The labour bill on every farm must be justified by results.

The labour bill during the year 1921-1922 on 26 Yorkshire farms of 5,285 acres has been examined, and was found to vary from about £1 8s. to £18, with an average of about £3 12s. 6d. per acre.

If we judge by "labour bill" alone, it would appear that certainly the figures regarding the first 7, and probably those of the first 12 farms were too high, and that the last 5 and possibly the last 11 farms were not paying sufficiently high wages.

Farms, however, are not run on philanthropic lines, and the final decision as to what each individual farmer is justified in paying as wages to his men will be decided by what his men are enabled to do for him.

In other words the wages bill on each farm will finally be justified by the "gross income" or better still the "net output" which the labour employed on the farm obtained.

When we put the actual labour bill per acre against the income received for every pound spent in labour, or the net output obtained from the farm for every £5 spent in labour, we can readily judge whether the labour bill on any particular farm was justified or not, and can certainly form an opinion as to the efficiency of its labour organisation. On the average last year on the whole of the 26 farms the gross income was roughly four and a half times the labour bill, and for every £5 spent in labour, the average net output amounted to £6 5s.; in other words last year labour took approximately 80 per cent. of the output.

In the case of farm H.W.C. the labour bill was decidedly high, though not so unreasonably high as might at first have been imagined. The gross income from this holding amounted to £63 per acre. Had the labour bill borne the ratio to the gross income that has been found to obtain on the 26 farms quoted, either the gross income should have amounted to £80 per acre instead of £63, or the income actually obtained would have justified an expenditure not of £18, but of just under £14 per acre. The net output from this holding amounted to £21 8s. per acre, which should have sufficed to satisfy the reasonable demands of farmer, labour and landlord. As the land was rented at £3 5s. per acre, and as the labour bill absorbed just over £18, it will be seen that little more than half-a-crown per acre would be left as profit for the farmer. If we distribute this net output, not according to what might be looked upon as a fair proportion for each claimant to take, but according to the average proportion actually determined last year, it will be found that of a net output of £21 8s. per acre, labour might have been expected last year to claim £17 5s. instead of over £18 as actually received. The labour bill on this farm may therefore be considered as approximately £4 5s. per acre too high when judged by the gross income obtained from the farm, and about 15s. per acre too high when judged by the net output.

On farm R.S.F., a small holding of 32 acres where the labour bill amounted to £13 3s. 8d. per acre, the gross income to £43 12s. 4d. and the net output to £8 18s. 10d. per acre, the

labour bill was again too high from whatever standpoint we view it. Judged by the wages actually paid on other farms, it was approximately £9 10s. per acre too high; taking into account the high gross income obtained from the holding it is still more than £4 per acre too high; and when, finally, judged by net output, it is at least £6 too high. One would certainly be standing on safe ground in pointing out to the management that the labour bill on that particular farm must be kept within the limits of £8 per acre, if it is to be run as a commercial success.

On farm P.O.H., 120 acres, the labour bill amounted last year to £6 18s. per acre, the gross income to £57 9s. 10d., and the net output to £22 6s. 1d. per acre. The labour bill per acre was approximately double what has been found to obtain on all the farms costed, yet in this case labour was not taking more than its fair share. On the basis of the gross income, the farmer was paying £5 per acre, and on the basis of the net output nearly £11 per acre *less* than the average so paid on the other farms. The labour bill here was high, but amply justified; every penny was well spent, and all the money well earned.

On farm C.M.F. the labour bill was £6 4s. 10d. per acre, the gross income £11 18s., and the net output less than £1 per acre. Here the labour bill was undoubtedly high, and there was nothing in either the gross or net returns to justify the high wages so paid. Whether this was the fault of the labour engaged or of the management concerned could easily be shown by further investigation of the accounts. On the basis of the gross income obtained, there was apparently justification for an expenditure only of £3 per acre instead of over £6, while had labour been content with 80 per cent. of the net output, the proportion in the average figures, it could only have laid claim to approximately 15s. per acre.

On farm M.A.H., the labour bill amounted only to £2 12s. per acre. Even this low figure was too high if we were judging by results, for the gross income amounted only to £6 6s. 9d. and the net output to £0 14s. 9d. per acre. Of the gross income, labour took 41 per cent., as compared with an average last year of 23 per cent. on the other farms; and an amount equal to 349 per cent. of the net output as compared with an average of 80 per cent.

On the other hand labour bills on farms H.N.O. and W.A.R., and possibly on J.H.S., might with advantage have been increased, and it would most probably have paid the farmers in these cases to have made such an increase.

		<i>Labour Bill, per acre, actually paid.</i>			<i>Gross Income, per acre.</i>			<i>Net Output, per acre.</i>				
		£	s.	d.	£	s.	d.	£	s.	d.		
H.N.O.	...	1	8	6	...	17	19	1	...	4	2	1
W.A.R.	...	1	16	3	...	9	18	9	...	5	2	1
J.H.S.	...	1	19	8	...	9	12	8	...	3	18	0

Had labour on these farms been paid on results at average rates comparable to those paid on the whole of the farms, one would have felt that on H.N.O. a labour bill of approximately £3 15s., on W.A.R. of approximately £3 7s. 6d., and on J.H.S. of approximately £2 17s. 6d., could not have been considered too high.

Conclusions.—In our opinion the following conclusions may be drawn from this examination of farm accounts in Yorkshire :—

a. From the outbreak of the War up to the year 1918 labour was not getting its fair share of the increased prosperity of the farms.

b. It was not until January, 1920, that the increase in wages on the farm had actually risen in proportion to the increase of the cost of living.

c. At the time of the abolition of the Agricultural Wages Board the percentage increase in farm wages was approximately 20 points above the percentage increase in the cost of living, and in April, 1922, at least 45 points above.

d. If the claim be admitted that labour is entitled to a wage proportionate to the increased cost of living, on present rates it would not be until April, 1923, that the surplus it has obtained since January, 1920, would counterbalance the deficit from the outbreak of the War up to January, 1920.

e. The maximum percentage increase in farm wages since the outbreak of the War has agreed very closely with that which has obtained in other industries.

f. The percentage increase in the farm wages which were being paid in April, 1922, was apparently higher than in many other industries.

g. During the year 1919-20 labour took on the average 49 per cent., during 1920-21 78 per cent., and during 1921-22 84 per cent. of the net output.

h. During the last two years it has been getting more than the industry could reasonably be expected to grant.

i. On any well managed farm the labour bill will be determined by (1) the size of the farm, (2) the proportion of the land under grass, and (3) the system of farming adopted.

j. The manual labour required for carrots will be approximately $5\frac{1}{2}$ times, for potatoes $3\frac{1}{2}$ times, and for roots $2\frac{1}{2}$ times as great as that required for corn crops; for seeds hay it will be approximately $\frac{1}{3}$, for meadow hay $\frac{1}{4}$, and for pasture $\frac{1}{8}$ of that required for a corn crop.

k. The manual labour required in attention to a cow is 4 times that required in attention to a bullock, 8 times that required in attention to a pig, 24 times that required in attention to a sheep.

l. For the year ending 31st March, 1922, the average labour bill amounted to approximately £3 15s. per acre, but varied considerably on different farms. Last year it should not have been more than a quarter of the gross income, while on the best managed farms it rarely exceeded one-fifth of the gross income. Even last year, it should not have exceeded 80 per cent. of the net output, and, if the share which the farmer is to receive is again to become a reasonable one, it should not greatly exceed 40 per cent. of the net output.

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COUNCIL OF AGRICULTURE FOR WALES:

THE AGRICULTURAL POLICY RECOMMENDED BY THE COUNCIL.

A SPECIAL meeting of the Council of Agriculture for Wales was held at the Raven Hotel, Shrewsbury, on the 13th October, 1922, with Mr. W. S. Miller in the chair. The meeting was called in accordance with the decision of the Council at its half-yearly statutory meeting in May in order to consider the report of the Sub-Committee appointed to draft suggestions for the formulation of an agricultural policy for Wales. The report of the Committee was considered in detail and adopted in the form in which it appears below.

I. Production from the Land.—We are of opinion that the land in Wales, which is mainly under grass, is not, from the point of view of the nation, producing what it should do in the way of food. We are convinced that a material increase in the production of cereals and forage crops is possible, and that this would result in a like increase in the output of live stock and live stock products. With the exception of a temporary change of practice during the war, there has been a steady and striking diminution in the area under cultivation in Wales during the period since 1871. A very large proportion of the land that has gone out of cultivation is now under grass of extremely poor quality, and the output from it is surprisingly low. That this land is capable

of improvement is evident from the results of experiments, but the area on which any systematic effort at improvement has been made, is, having regard to the total area involved, deplorably small.

A comparison between the areas under cultivation in 1871 and 1921 is shown in the table below :—

					1871.	1921.	% Decrease.
<i>Crop.</i>					<i>Acres.</i>	<i>Acres.</i>	
Wheat	...	...	...	...	126,334	38,750	69·3
Barley	...	...	...	...	169,751	86,716	48·9
Oats	...	...	...	...	253,672	229,464	9·5
Total Cereals					549,757	354,930	35·4
Potatoes	...	...	...	...	51,853	26,152	49·6
Turnips, Swedes and Mangolds	...	...	...	...	77,213	60,351	21·8
Arable Land	...	...	...	...	1,110,170	774,724	30·2

We are aware that, while the area under cultivation has decreased, the live stock of the country has increased during that period. We give below a table showing the live stock population under different heads in the years 1871 and 1921 :—

					1871.	1921.	% Increase or Decrease.
<i>Class.</i>							
Cattle	...	...	...	...	596,588	724,417	+ 21·4
Sheep	...	...	...	...	2,706,415	3,216,877	+ 18·9
Pigs	...	...	...	...	225,456	215,362	— 4·5

It is now generally recognised that, as a rule, the production of food on arable land is largely in excess of what it is on grass land. Although there has been a large increase in cattle and sheep in the period under review, it is, in our opinion, doubtful whether the increase that has taken place under these heads is sufficient to compensate for the reduction in the area of land under cultivation during the same period. Having regard to all the circumstances, we have serious doubt as to whether the present production of agricultural land in Wales, taken in terms of actual food values, is equal to what it was in 1871.

We have already drawn attention to the very large acreage of pasture in Wales that is of inferior quality, and this is apparent to everybody. It is true that much of the land is naturally poor and that grass of superior quality cannot be expected in these circumstances. We feel sure, however, that a very large proportion of the pasture land in Wales, even though it may be on soil that is naturally poor, can be much improved if proper methods are adopted to that end. The experience of the last twenty years has clearly demonstrated that such manures as basic slag can be used on pastures to enormous advantage. In view of the excellent results obtained in places where this has been tried, it is a matter for surprise, as well as concern, that the application of such manures to grass land has not become a much more extensive practice.

II. **Reform of the Land Laws.**—We urge the necessity for reforming the law as it relates to land so as to ensure to the tenant farmer—

(1) A fair rent, which, in all cases of dispute, should be fixed by arbitration, the right to demand such arbitration being given to both the owner and the tenant, the existing Acts, where necessary, being amended.

(2) Full compensation for all improvements, the Agricultural Holdings Acts, 1908 to 1921, being so amended as to enable a tenant to carry out

any improvement suitable for the ordinary working of the farm on notice being given to the owner, and to be entitled to compensation under the Acts unless the owner proves to the satisfaction of the Ministry of Agriculture, as an independent authority, that the proposed improvement is unnecessary, Part I of the First Schedule of the Act of 1908 being revised accordingly.

(3) Security of tenure conditional upon (a) the practice of good husbandry by the tenant (b) the land not being required in the public interest, or by the owner to farm either himself or by a member of his family, in which case he should be required to prove to the satisfaction of an independent authority that his grounds for requiring possession are reasonable.

We fully recognise that the landlord and tenant system which has long been a feature of the agricultural economy of this country has great and obvious advantages. It is clear, however, that, under the pressure of circumstances, that system is inevitably breaking up, and some other system has to be substituted for it to an increasing degree as the years pass. The demand for security of tenure on the part of tenant farmers is mainly due to the fact that so many owners choose, or are compelled, to dispose of their estates. The only alternative to the landlord and tenant system that could give the tenant a fuller measure of security would seem to be either universal State ownership of land or a scheme by which occupiers are enabled to become the owners of their own holdings. No system yet devised is free from some disadvantage.

We recognise that for the occupier to be the owner of his own farm is not wholly an advantage either to the farmer himself or to the State. Financial embarrassment in such cases is frequent, and, while there are exceptions, experience does not show that those who own their own holdings use the land to better purpose than those who are tenants. On the other hand, it is undeniable that a large number of those who have been brought up on the land, and of the smaller farmers particularly, have a strong desire to own their own holdings, partly because of the sense of security that ownership gives them, and partly also on quite other grounds. In view of this, we consider that the State should offer facilities to enable those who so desire to become the owners of their own holdings. On the same principle we are of opinion that, subject to proper conditions, the State should extend facilities to owners of estates for the purpose of improving and developing their properties.

III. Position of Workers.—We feel that there is need for improving the position of the agricultural labourer, both by securing for him an adequate wage, with the assistance of local Conciliation Boards, and by providing him with better opportunities for cultivating land on his own account. We urge upon agriculturists the desirability of providing land voluntarily for agricultural labourers, wherever possible. We also feel strongly that steps should be taken to provide, with the assistance of the State, local authorities and private owners, adequate and suitable housing accommodation, including tenements of the cottage holding type, in rural districts.

IV. Small Holdings.—We are fully in sympathy with the policy of creating Small Holdings with which the State is so definitely and closely identified. The mere splitting up of the land into holdings of a small size is

not, however, necessarily an advantage. We are satisfied that a large number of the small farms, so typical of Wales, are entirely uneconomic as they are. To be successful they should be either reduced still further in size or made larger. The nature of the land in many parts of the country is such that it can only be worked economically in large farms. It is also true that there is good land in favoured situations which could be put to much more profitable use if worked as intensive small holdings than is the case now when it forms part of medium sized holdings used for mixed farming or stock-raising. We are simply reiterating what every reformer has emphasised, when we say that it is essential, in the interests of the nation, to maintain a large and flourishing rural population, but we desire at least to associate ourselves with that view.

We consider that the creation of small holdings and the improvement of the position of the agricultural worker on the lines indicated in the preceding paragraph would go a long way towards solving the problem of maintaining a rural population, provided that a definite policy is pursued of selecting suitable men for the holdings, and that the holdings themselves are placed on suitable land and in favourable situations.

V. Agricultural Education.—Agriculturists have reasons to be gratified with the additional provision that has recently been made in connection with Agricultural Education and Research. So strongly convinced, however, are we that a high standard of Education and technical knowledge is to be more than ever the need of the agricultural community of the future, that we can regard the provision now made as adequate only for the time being. Although the position of Agricultural Education and Research is more satisfactory than it has ever been, we feel that much remains to be done in connection with general education in the rural districts of the country. In our opinion, the ordinary curriculum of the rural Elementary Schools should be adapted to the needs of the district, and in all such schools Elementary Science with a rural bias should be taught. We also consider that in any Continuation Schools that may be established in rural districts in the future the curriculum should be so framed as to arouse the pupils' interest in rural life. Amongst other things, we think it is eminently desirable, on educational and other grounds, that the attention of the pupils should be drawn to the principles of Economics and such subjects as Farm Accounts. Something in this direction might be done with advantage even in the Elementary Schools.

VI. Road Transport.—We strongly urge the necessity for improving and widening existing district roads and for the construction of new roads to provide routes for road motors to convey traffic between country districts and railway centres.

VII. Credit.—We consider that a Credit Scheme on the lines of the scheme in operation during the War should be established and so developed as to enable farmers and smallholders to obtain temporary assistance for the purpose of carrying on their business.

VIII. Land Drainage.—For the country as a whole there is hardly any improvement that is more needed than land drainage, and we are greatly concerned that operations under the Drainage Act of 1918 have had to be suspended. We strongly recommend that the provisions of the Act should be put fully into operation as soon as possible, as we are convinced that large

tracts of land in Wales that are now useless for agricultural purposes, would, if properly drained, become highly productive.

IX. Local Taxation.—We are of opinion that it is necessary to readjust the burden of local taxation so far as it affects agricultural land, inasmuch as under the present system the farming industry is over-rated. The farmer's business involves the occupation of a disproportionate amount of rateable property, as regards its income earning capacity, as compared with other industries, and certain of the services in respect of which rates are levied are of less benefit to the farmer than to the other classes of the community.

We would call attention to the view expressed in the Majority Report of the Royal Commission on Local Taxation, 1896, to the effect that, in view of the character of agricultural property and the amount of the profits derivable therefrom, and the relative extent to which benefits accrued to the property and to its occupier by reason of the expenditure incurred by local authorities, it would be inequitable were rates to be paid on the basis of its full annual value. This was recognised in the Agricultural Rates Act of 1896, which made provision for the assessment of agricultural land at one-half of its rateable value, a fixed contribution equivalent to one-half of the rates paid on agricultural land in 1895 being made from the exchequer. While, however, the rates have increased enormously since that year, the relief afforded under the Act of 1896 has remained the same. It is readily admitted that the incidence of local taxation at the present time is unjust, and that the whole system of assessment to local rates requires reconsideration. Pending opportunity for such revision, we consider that the differential rating in favour of agricultural land should be extended, and that for rating purposes the occupier of agricultural land should be called upon to pay rates on one-fourth instead of one-half of its rateable value, the deficiency being made good by means of an Exchequer grant to the Rating Authorities.

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THE DUCK AS AN EGG-PRODUCER.

A. T. JOHNSON.

DURING the last two or three years the extraordinary prolificacy of the laying breeds of ducks has been brought prominently to public notice by the wonderful results attained at laying tests. These events, however, while undoubtedly proving the great superiority of certain strains of ducks over pullets of the highest fecundity, in so far as number and weight of eggs are concerned, do not indicate what is to the farming community no less important, viz., the peculiar position of the laying duck as an asset in the economics of agriculture. To know what a flock of Runner or Khaki Campbell ducks is capable of producing under certain conditions is of undeniable value; but the farmer must also know what such a flock is likely to do under free range management where there are considerations to be met which do not occur within the enclosures of the laying test.

It may therefore serve a useful purpose to discuss briefly the merits of the laying duck in its relation to the ordinary practices of farming. It may be said, in passing, that, phenomenal as the fecundity of the ducks competing in the tests has been, it is the opinion of practical duck-keeping farmers, that if such results can be achieved in the conditions prevailing at these tests there is reason to believe that they can be equalled on the farm. That, indeed, has been my own experience in free-range duck farming for eggs.

Of not less significance than heavy laying is the question of upkeep. Here the farmer is at a distinct advantage, and it is this matter of upkeep, or cost of production, together with its bearing not only upon direct profits but upon the economics of farm practice which must be emphasised here.

The laying duck is essentially a forager, and that characteristic is so strongly marked that the Indian Runner is to the old farm waddler what a light and active, laying-type Leghorn is to some lethargic Asiatic table bird. Given a wide range on almost any kind of land and the Runner will very nearly feed itself from spring to autumn, though many duck-keepers consider that it generally pays to give a good feed at night. During that period, for example, I have maintained flocks of these ducks on a single light feed of oats, or dredge corn, daily, and they have laid abundantly. Not infrequently, indeed, as during warm, rainy weather when the forage was good, or when the birds were on stubble, hand feeding has been entirely suspended without the egg yield being impaired in the slightest degree.

Significant as these things are in considering the financial aspect of the matter, the farmer will not lose sight of the fact that in maintaining itself and providing eggs the laying duck is doing great service by destroying insect pests. The income derived from its eggs may be the only direct and tangible return upon which to estimate the bird's actual value to the balance sheet, but few of us who have kept such flocks in field colonies but will do the duck due justice by crediting it with taking the part of pest destroyer in the general scheme of farm work, and this is not to be considered lightly.

Omnivorous as the duck is, it is animal food which she seeks with the greatest keenness, and the more she lays the acuter becomes her appetite for such a diet. Those who have kept laying ducks in confined areas know full well how necessary meat in some form is to good laying, how much more necessary it is

than for laying hens. It is the natural craving for proteids in the shape of insect life which makes the Runner duck such an untiring forager.

Farm land varies considerably in the quantity of insect life and grubs which it carries, but few farms, grass or arable, are so fortunate as not to be sufficiently stocked with pests of this kind to keep busily employed flocks of ducks disposed at the rate of 6 to 10 to the acre. I have, on suitable land, kept fully twice as many birds the seasons through for several successive years, but the best of feeding ground becomes exhausted, so that periodical changes are desirable. The fact that flocks of these ducks will considerably reduce the stock of insect life on a given area supports the contention made by some people that such birds are natural destroyers of many noxious insects.

Perhaps one of the most noteworthy examples of what such ducks are capable of performing on behalf of agriculture is that afforded by the fact that to my knowledge they are devourers of the fresh water snail which is directly responsible for liver-fluke in sheep.

At certain periods of the year I have known Runner ducks to devour enormous numbers of crane flies (the parents of the leather-jacket grub) as these emerged from their pupa cases, and as the "rise" from the pasture of this destructive insect often takes place during the dusk of late evening, ducks, which are often most active at such an hour, have an opportunity if not shut up too early of securing this prey which other poultry cannot enjoy.

Slugs and snails are eaten with great avidity by ducks, and there are instances on record which tell us how a flock of these birds has completely eradicated the little white slug which is often so injurious to clover and other pasturage. The click-beetle (parent of the wire-worm) is also sought for and devoured, as examinations of crop contents have plainly shown, and another pest which, like the crane-fly, is often to be secured at dusk, is the cockchafer. These fat and luscious morsels, both the young adults as they emerge from the ground and the egg-depositing females, are greedily swallowed by foraging ducks.

Though it is doubtful whether ducks are able to have much effect in destroying noxious larvæ in grass the same end is eventually achieved by the eradication of the parent insects. On arable land, however, especially when ploughing or other work is in progress, the quantity of wire-worm, leather-jackets, chafer grubs and other larvæ eaten by ducks is enormous. Their appe-

tites never flag when such fare is being turned up, and so long as the ploughman is at work so long will they follow at his heels, and examine every particle of the soil much more thoroughly and exhaustively than will the attendant gulls and rooks.

One need not dwell further upon the stimulating effect which this insect fare has upon the prolificacy of laying ducks, nor is it necessary to point out the convincing lesson in agricultural economics which is conveyed by the above statements. Practical, wide-awake farmers can draw their own conclusions.

There are one or two other matters, however, which may be mentioned, and one of these is the question of injury to growing crops which may be done by flocks of ducks. In regard to this one can confidently say that no class of poultry is more easily kept within bounds than ducks, and it is the common experience of all who have kept them that they prefer pasture or waste land to arable. Since they do not scratch, ducks can range fields of young roots, potatoes and other crops without doing other than good, and the flocks can be run on seed grass and clover without any fear of the young plants being injured as may sometimes happen with other poultry.

They will, however, eat and damage any young plants of the cabbage tribe, and will burrow for newly-sown corn, and may consequently be poisoned by copper sulphate used as a seed dressing.

Finally, the Indian Runner, and indeed most of the laying breeds, keep perfectly healthy and produce fertile eggs without swimming water. All they need is water to drink, morning and evening, and the realisation of this characteristic should remove what has for generations bred an antipathy towards ducks on the farm, viz., the complaint that they foul the drinking water of other live-stock.

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DRY-MEAL HOPPERS FOR PIGS.

CAPTAIN CALLCOTT REILLY, M.B.E., B.Sc.

WHAT may be termed the self-feeding of dry meal to pigs is a question that is receiving considerable attention at present, and hence certain results obtained, and reasons for adopting this method on a commercial scale, may be of some interest. This article has reference to a commercial herd of some sixty sows, all the progeny of which are kept on the farm, and fattened for a co-operative bacon factory.

The herd was started in 1920 by a Danish bailiff, to be run on Danish lines. Good farrowing and fattening sties were built, but the pigs did not do as well as might have been expected. The experiment was tried of running pigs in the store stage out in orchards, which was an improvement. Then the sows with their litters were run in orchards, which was another improvement—scour in the piglings, which had been a source of trouble, becoming very much less prevalent. The pigs in the fattening sties, although well fed three times a day and kept scrupulously clean, did not thrive as they might have done, and the net result was that the pigs, weighing about 16 stone alive, averaged nearly 9 months old when ready for the factory.

Experiment with Store Pigs.—It was while seeking for improvements that papers by Professor Evvard, of Iowa, U.S.A., were obtained. at the end of 1921, describing the remarkable results achieved by self-feeding pigs, and allowing them their choice of carbohydrates and albuminoids. It was therefore decided to try the method on a bunch of young stores running out. A self-feeder was improvised out of an old sheep hay rack, by fixing flat galvanised iron sheets inside the V rods, and cutting holes at the bottom for the meal to run through into the trough. The hopper thus contrived was divided transversely into half a dozen different compartments, and a different feed placed in each, in order to see which the pigs preferred. The results were as follows : —

31 store pigs, weighing from 6 to 8 stone each, live weight, ate in 7 days :—

Mixed meal (maize, wheat, and barley, ground together in equal proportions)	...	...	49 stone.
Rice meal	...	...	22 "
Fish meal	...	...	8 "
Palm kernel cake	...	...	5 "
Whole peas (soaked)	...	...	10 "
Whole maize	...	...	4 "
Average, 6 lb. per pig per day.			
Nutritive ratio, albuminoids to carbohydrates, 4·7.			

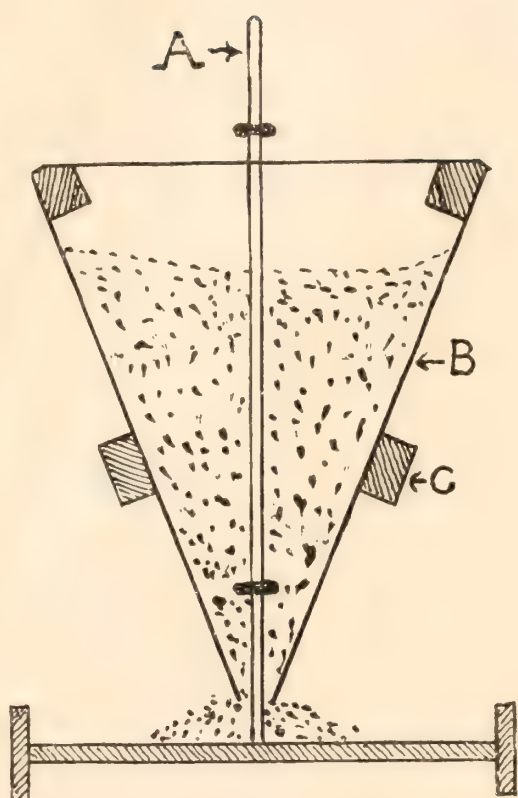


FIG. 1.—Cross Section of Feeder in Sty.
A.—Iron railing dividing the sties.
B.—Galvanised iron sheeting.
C.—Tongued and grooved board ends.

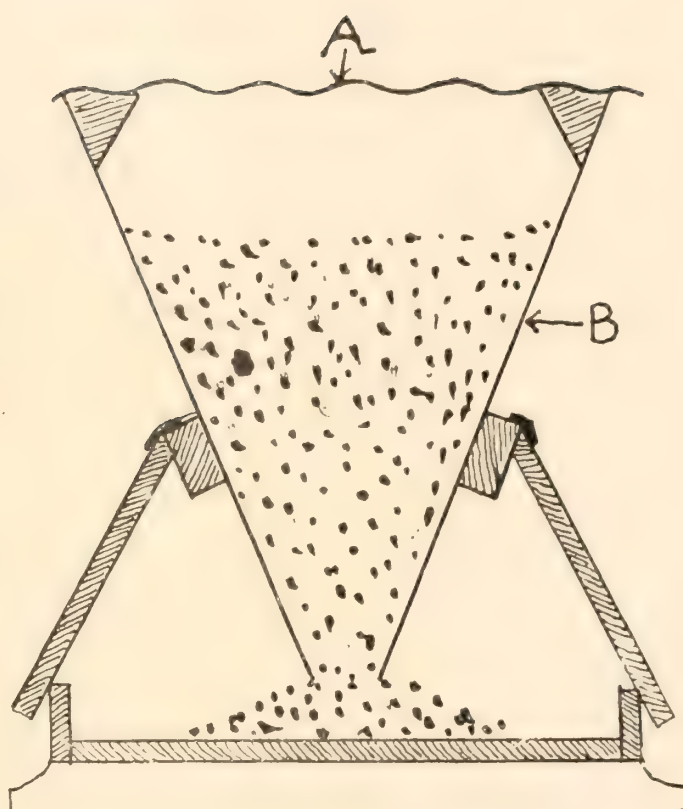


FIG. 2.—Cross Section of Feeder shown
in Fig. 3.



FIG. 3.—Dry Meal Self-Feeders in use.

It will be noticed that the pigs rationed themselves very well, but that they were not keen on palm kernel cake. The hoppers were always kept full, except those containing whole soaked peas and maize, as the pigs ate these as quickly as they were put in. They were therefore discontinued after two days.

The pigs obviously ate too much at first, but as they got used to self-feeding the consumption dropped, and after a short time they were only averaging $4\frac{3}{4}$ lb. per pig per day.

On various occasions the amount of meal consumed by bunches of pigs has been weighed before being put into the hoppers, with the following results:—

<i>No. of stores.</i>	<i>Average live weight stones.</i>	<i>Meal per pig per day. lb.</i>	<i>Period of weighing meal.</i>
35	9	4.7	3 weeks.
20	9	4.8	1 ..
20	9	4.75	2 ..
15	8	4.8	1 ..
17	6	4.1	2 ..
18	6	4.2	3 ..

Before dry feeding was adopted, the pigs were allowed a ration of $4\frac{1}{2}$ lb. per day, and as much green stuff and roots as they would eat. The all-round improvement in their condition after being dry fed for some weeks was very marked, particularly among the smaller pigs, which now got all the meal they wanted, and were not thrust aside by the larger ones.

Fattening Experiment.—An experiment was then carried out in the fattening pens, where there were facilities for weighing the pigs. A bunch of 12 stores was divided as nearly as possible into two equal lots; one lot was dry fed, and the other lot slop fed three times a day, with as much food as they would clear up. The period of the experiment was six weeks and the following were the results:—

	<i>6 pigs on wet food.</i>		<i>6 pigs on dry food.</i>	
Original weight ...	51 stone 4 lb.	...	51 stone 1 lb.	...
Final weight ...	78 .. 1 ..	...	87 .. 11 ..	...
Meal consumed ...	116 ..	...	151 ..	...
Meal consumed per lb. live weight gained...	4.4 lb.	...	4.1 lb.	...
Average daily gain per pig ...	1½ lb.	...	2 lb.	...

The stores had been used to slop feed when the test began.

This test was enough to show that, taking into consideration the great saving in labour, dry feeding was likely to be a paying proposition, and double dry feeders were installed in every other

partition between the sties. These were roughly constructed as shown in the cross section, the sides of the hopper being made of flat galvanized iron. The length is 3 ft., which is found to be ample for two pigs to feed simultaneously on either side.

Sows and Litters.—Dry feeders were now tried with great success for the sows and litters, and the result has been that the sows milk better, the little pigs never suffer from scour, and there are no difficulties at weaning time, as they start eating the dry meal, which is always sweet, and carry straight on with it after weaning without the usual set-back.

Stores.—For a month after weaning the stores are dry fed in orchards, and several advantages are noticeable, the most important of which is that no matter how many are run together, they all get an equal chance. After this stage they are usually folded on vetches, kale or roots, and are not dry fed, but have soaked whole maize and beans thrown to them, in order to make them live chiefly on the green food. At about 9 stone live weight they go to the fattening sties, where they are again put on dry food, and a constant supply of green stuff or roots, which is most important. Of course the pigs must always have water, and a very interesting point is that the amount of water consumed in the fattening pens is now only half of what it was under the slop system of feeding.

In-Pig Sows.—An experiment has been made with success in dry feeding the in-pig sows. It was found that by feeding only palm kernel cake and fish meal, neither of which is very palatable, with green stuff, the sows did not get too fat, but kept in nice breeding condition, only consuming about 5 lb. of meal per head per day.

As this is purely a commercial farm, there has not been time or opportunity for a number of interesting experiments which might have been carried out, but the main result of dry feeding has been that the average age of the bacon pig has been reduced from 9 months to 7 months and a substantial saving in meal and a great saving in labour have been effected.

For outside use it was found that a door over the food troughs was necessary, in order to prevent the meal from being blown away, and to keep out birds and vermin. At first a vertical swing door that pushed inwards was adopted, but it was found that the pig usually took a mouthful of meal, withdrew its head to chew it, and dropped a certain amount on the ground. Lift-up flap doors were then adopted with great success. The pig has

to nose up the door, which rests on its head, and does not withdraw until it has finished feeding, thus entirely eliminating waste.

One difficulty with self-feeding is the cost of the feeders, most of those on the market costing over £10 apiece. The one shown in the photograph was home made, but farmers who have no facilities for making them may purchase well-made feeders to take four pigs at a time for the very reasonable sum of £2 19s. 6d. each.

There is little doubt that self-feeding pigs has come to stay, as by this method the pig is correctly fed, little and often, all pigs get the same opportunity, and there is a large saving in the labour bill; also the difficulty of correctly rationing the pigs is eliminated with the self-choice system, as the pigs ration themselves.

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THE CRATE-ROD AND BARREL-HOOP TRADES.

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Lack of Intercourse between Producer and Consumer.—Crates and barrels are in constant use for packing pottery, jam, fish, bottles and many kinds of “dry goods,” and in the south of England are many acres of hazel whence rods and hoops can be obtained. The Potteries of Staffordshire form one of the important markets for crate-wood and barrel-hoops. The trade probably survives spasmodically in most of the districts where plenty of hazel can be found. But one suspects that many opportunities are wasted through lack of knowledge concerning mutual requirements, and that with a better understanding at either end the trade might be stabilised and greatly improved. Woodcraftsmen and estate agents know little of the exact requirements of the trade or the pressure of foreign competition and the reasons for it; the coopers and crate-makers and potters of Staffordshire know little of the woodland districts and the conditions under which the wood is grown and worked. For example, the owner of certain osier-beds which had not been cut for four years wanted to sell the rods to a crate-maker. Unfortunately he cut them too late in the season; willow crate rods are used while green, but are not worth stacking for later use.

Therefore the rods remained unsold. Another example is seen in the statement made in Cornwall that French hazel hoops are better than English, being more "suent." On inquiry in the Pottery towns it was learnt that French hoops are cut at shorter intervals, and are therefore more suitable than English ones for small fish-barrels, but no use at all for the big pottery "tubs" used in Staffordshire. Closer contact with the market would enable estate agents or the estate woodmen to cut at the right periods for the most convenient market, and would induce them to devote more care to those woods that are favoured by soil, aspect and situation for producing what is required. If a manufacturer can save his labour costs by getting better material, it is worth his while to give a better price.

Casual Growth of Trade Connections.—The following story will illustrate the casual way in which trade connections grow up, and explains the tenacity with which they are kept up once they are made, and the sudden collapse that may occur in a small industry if a trade connection is broken through death or from some other cause.

A crate-maker in the Potteries who was setting up in business applied to the local goods station for a list of firms from whom crate-rods and barrel-hoops had been received. He wrote to the man whose name happened to come at the head of the list, and has dealt with him ever since. On getting an inquiry for crate-rods, this man, who lived near Basingstoke, replied that he was willing to send them but wanted to know how he would get the money. Whereat the crate-maker promptly sent him a cheque for £50, and told him it would be "quite all right; you have only to take it to one of the local tradesmen and ask him to cash it for you, and send along the stuff as soon as it is ready." This confidence was not abused, the consignment of wood arrived in due course and cheques and crate-rods continued to be exchanged periodically. Curiosity at length caused the dealer to visit the unknown but open-handed crate-maker who was making his fortune. He returned with much information concerning the trade and general conditions in the Pottery Towns that could not fail to be of use to him, and with the idea, quite new to the smallholders and farmers of the Hampshire woodlands, that such information could be freely passed about amongst rival crate-makers and coopers. "In the south," said the crate-maker, "the less you say the more they think of you. Here we are very free."

Barrel-Hoop and Crate-Rod Making in Hampshire.—The woodland industries of Hampshire and Berkshire, with the local system of ownership, cultivation and dealing, have been described elsewhere.* Barrel-hoop shaving and crate-rod cutting are branches of the woodman's art, rather than separate trades. Crate-rods are of several sizes and are sold in bundles known as "seventy-fives," "forties," and "twenties."† For barrel-hoops rather stouter hazel wands are split with a blunt tool to two or three or four bands and shaved on the inner surface so that they lie flat against the barrel. The bark forms the rounded outer surface. The wood is cut to the various lengths required by means of a simple measuring apparatus, consisting of a row of stakes driven into the ground at the correct intervals. Barrel-hoops differ from 2½ ft. to 15 ft. in length. The Hampshire names for the hoops are "daughters," 2½ ft.; "short pink," 5 ft.; "long pink," 6 ft.; "firkin," 7 ft.; "kiliken," 8 ft. Nine feet, ten feet, and all the intermediate half-sizes have no other name, but eleven feet is "short pipe"; twelve feet "long pipe"; thirteen feet "middling," and fourteen feet "swinger." It is said to take about a month to learn the work so as to do it at a remunerative pace, and it would be a valuable occupation for a woodman which might keep him busy the whole winter.

It is not surprising that potters and coopers prefer to trade with some known dealer rather than with the "little farmers," as they call the rural wood dealers, who are sometimes uneducated and illiterate. Talking of unreliable deliveries, a crate-maker said, "I am not particular if there's a bundle or two short, but if it goes on every time, I get up against something." The unreliability is not only on the side of the woodlanders. Fluctuations which have made the trade so risky for the woodlanders and local dealers have sometimes been due to bankruptcy or to dishonourable practices amongst crate-makers. Consignments have been ordered in advance and when the time has come for payment, excuses have been made that the material was faulty; or the vendor has been recommended to sell his stock to some other crate-maker because the man who ordered it no longer requires it; or the purchaser, having resold the consignment at a profit, has disappeared without paying for it. Even if such cases are rare, there have been enough to shake the confidence of men far away with no knowledge of business, who could get no

* *The Rural Industries Round Oxford*, pp. 79-102.

† The prices quoted in the spring of 1921 were 2s., 1s. 9d. and 1s. 6d. respectively.

guarantee of good faith, and they are not soon forgotten. Fortunately, organisation is extending to the Staffordshire crate-makers and coopers, and in their own interests they are anxious to put an end to such practices. A wood dealer if only he knew it, can now refer to the Secretary of the Crate-Makers' and Coopers' Association, 33, Albion Street, Hanley, Staffs., with inquiries as to the reputation of any cooper or crate-maker who wishes to buy from him.

Coiling of Barrel-Hoops.—Barrel-hoops are tied into straight bundles of fifty, sorted according to size, and are usually despatched thus from the Basingstoke district. Nevertheless, coopers and potters prefer to get them ready coiled, even though freights are a little higher owing to the greater space required for coiled hoops in transit. Coiling used to be done at Aldermaston but it died out before the War and has only recently been resumed. Meanwhile the rods were sent to London to be coiled by London coopers, who apparently had big coiling plants. Basingstoke barrel-hoops and crate-rods are known in Staffordshire and elsewhere as "London" rods or hoops, no doubt owing to the enterprise of some London cooper who bought them from the country and distributed them. It seems wasteful for such cheap goods as barrel-hoops to bear the double transport expenses incurred in sending them to London to be coiled and then to the Potteries or to some other market, and except for the London market it would appear to be more economical to coil them at the source. A big Staffordshire firm of coopers set up a coiling plant during the War because it was unable to procure coiled hoops, and had big packing contracts. After the War the plant was sold, since even in this big cooperage there was not enough work to keep the plant busy for more than about one day in the week, so the capital was lying idle. Coiling can easily be done by a very simple apparatus while the wood is green, and when dry the wood can be soaked and coiled inside a cylinder to dry, so that it keeps its shape after removal and can easily be held in position while the cooper fastens it to the barrel. If a large trade were to be organised from one of the railway stations such as Aldermaston or Alton whence wood is despatched, coiling machinery might pay, and it is quite possible that the difficulty is merely that of collecting sufficient capital to buy up local barrel-hoops in large quantities. Many difficulties might be solved by passing all the local crate and barrel-hoop wood through the hands of a local coiling, packing

and distributing firm, and the increasing organisation at the market end of the trade should tend to make such a venture safer than it could otherwise be.

Stacking Barrel-Hoops and Crate-Rods.—Small consignments of hazel barrel-hoops and crate-rods are wanted during the winter months for current use while green. Workmen prefer to use them green while they are easy to bend and twist. The bulk of the wood, however, is sent off in the spring for stacking. If properly stacked it is said to keep in good condition for two years. The stacking is important, for if there should be a slump in the pottery trade and consequently in crate-rods, a wood dealer may incur very heavy losses through deterioration by keeping his stock a whole year. A piece of bark is stripped off the whole length of the wood for barrel-hoops to prevent rotting. Crate-rods, which are finer, are merely stacked when dry, the butt ends outwards, and protected from the wet with a thatch of twigs. The larger wood for “crate heads.” is “scotched,” i.e., a patch of bark removed.

By April or May the wood has become dryer and lighter, and consequently freights are lower. In January, 1921, when the wood was wet and heavy, a load of crate-wood from Alton, Hampshire, weighing 3 tons 13 cwt., cost as much as £7 4s. 10d. in carriage. whereas in May two loads from Aldermaston in Berkshire travelled for £5 18s. 8d. and £2 2s. 5d. respectively. From Market Drayton in Staffordshire a load costing £5 was procured at a cost of only 10s. in carriage.

Crate-Making, Importance of Good Material.—Crate-making has not even yet entirely died out as a rural industry in Staffordshire, though the bulk of the industry has come to the towns, not only because made-up crates are bulky and inconvenient to take in from the country, but for other reasons. A master explained:—“It is education; the men found that they could come into the towns and get the best material to work on, and earn more money. They won’t moil themselves over work when they see others getting more pay for less work!” Crate-making shares with other trades the reputation amongst its workers of being the “most down-trodden trade in existence.” In the country in Staffordshire the earnings were only about fifteen shillings a week, and probably more precarious than the agricultural wages.

A master crate-maker who had himself been a workman laid great stress on the importance of getting the exact sizes, shapes,

and kinds of material. The poles for crate-heads, which are the stout pieces forming the corner uprights of the crate, should either be only thick enough for one, or just thick enough for two, crate-heads. If thicker, too much labour is involved in splitting them up. They should be straight enough for straight lengths of three or four feet to be cut from them, but need not be so straight as for turnery, since these would probably be dearer. As to the kind of wood for the crate-heads the crate-maker was indifferent, though he did not much care for fir on account of its knots.

Dutch Competition in the Barrel-Hoop Trade.—Bad trade in the woodland districts is laid at the door of foreign competition. It is true that Dutch willow hoops have been coming to the potteries at about a quarter of the price of the English hazel hoops. One firm of coopers estimated that only 30 per cent. of its barrels could have English hoops at the current prices (August, 1921). These would be put on the best and biggest barrels, on which the extra price could be charged. Competition from Holland is due to the fact that the dykes are planted with willows which help to hold them up: the sale of the rods is of secondary importance to the safety from floods. “The Dutch hoops are cheaper because they can’t help growing them,” said one of the coopers. The greater increase of overland freights in England as compared with water transport has made Dutch competition especially severe since the War. For example, in the spring of 1921 a bundle of English 6-ft. barrel-hoops from Sussex cost 4s. 3d., including 1s. for carriage, and a bundle of Dutch hoops cost only 1s 0½d. including 7d. carriage. In consequence, although the English hazel hoops are far superior to the Dutch willow hoops, coopers can only use them on the best and most expensive barrels. Sometimes a barrel has a couple of English hoops as well as the Dutch ones, to give extra strength. Hazel hoops are stronger and more durable than willow, and will stand storing when dry. Willow is only suitable for use while green. Thus it is seen that foreign competition, severely as it hits the English hazel barrel-hoop trade, yet leaves room for a certain proportion of English goods owing to their superior quality. The proportion will vary according to the condition of trade in the pottery and other dry-goods trades using barrels for packing.

Relative Demand for Barrel-Hoops and Crate-Rods.—The market for English barrel-hoops and crate-rods might be im-

proved if freights could be reduced. Pottery for export is packed in "tubs" or barrels, except for big ware which is packed in crates. For the home trade only about one-fifth to one-sixth of the ware is packed in barrels, and the rest in crates. There has been much pilfering from crates at the ports and therefore companies have refused to insure small pottery unless it is packed for export in enclosed packages. The two crafts of crate-rod cutting and barrel-hoop shaving are branches of the woodman's art rather than separate industries, since the material for either can be found in the same woods, the same woodman can prepare both with a little experience, and the destination is the same for both. There is no direct foreign competition in the crate-wood trade, therefore it would be well, at times when foreign competition hits the barrel-hoop trade, to be able to turn to the other trade.

The crate-makers affirm that pottery manufacturers will only make their own crates if they can get plenty of cheap material and do it at a low cost. To protect their trade, the crate-makers must be sure of getting the material, and an interesting suggestion was made, emanating, it must be admitted, from a firm of coopers, not crate-makers. This was to keep up the price of crate-wood, which is the staple trade and does not suffer from foreign competition, and to lower the price of barrel-hoops so that there should be less disparity between the English and Dutch prices. The suggestion is quite in accordance with rural practice in regard to various wood products, especially where there are mixed woods. For example:—"We can't make a profit on firewood alone, it doesn't pay for the cutting; so we make up on turnery poles which fetch a good price if grown straight." "When we did a big trade in hop-poles, there was a lot of work in the woods, and it paid men to make barrel-hoops and crate-rods and hurdles." It may be, therefore, that organisation for protective purposes among the Master Crate-Makers and Coopers, may have a good influence on the conditions among the woodlanders. If there were some corresponding local organisation through which the interests of the landowners, woodland craftsmen, and local dealers could be expressed, much might be done to stabilise the uncertain and spasmodic woodland industries.

Conclusion.—It is useless to expect any appreciable improvement in the position of the English woodlanders unless market conditions are watched, not only by the dealers who buy up coppice-wood, but by the estate agents or landowners who are responsible

for looking after the woods, can choose which coppices are worth regular attention in the matter of draining, clearing and replacing dead stocks, and decide at what interval each coppice should be cut. The crate-rod and barrel-hoop trade shows need of attention to the supplies of wood, and it gives one illustration among many, of the need for an Intelligence Bureau to which all who are interested in woodland industries can contribute, and apply for information. Such information cannot be made available to the local people most concerned unless there is a local organisation to correspond.

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SEEDS AND GOOD CROPS.

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THE first essential towards the production of a first-class crop is to use only first-class seed. Such a description involves:—

- (a) Variety best suited to the land.
- (b) Good strain.
- (c) High purity.
- (d) Good germination.
- (e) Suitable country of origin.

Variety.—Experience will be the most useful guide as regards variety, and here the seedsman may be able to help, for he has opportunities of observing the different classes of seed growing on various soils and of comparing the resulting crops and yields. The County Agricultural Organiser should be able to give some information on variety trials in the county. Experiments can also be tried by growing two or three varieties in the same field and carefully watching the results.

Good strain is of great importance in cereals and roots, as these crops are liable to get very impure and poor after a few years. Great trouble is taken by the big seed growers to keep pure strong stocks of their seeds; inspection and rogueing of growing crops is rigorously carried out; and the resulting seed is cleaned very carefully—all small and immature seed being eliminated. This labour adds considerably to the cost of the seed, but it will add much more to the resulting yield, and in the case of cereals to the value of the grain when marketed. The cost of the seed is not a big item in the cost of raising a crop, and a few shillings more per acre will usually be well repaid by an increased crop. This has been demonstrated repeatedly by

experiments. The purchase of seed from reliable merchants is the safest plan.

Purity means freedom from other crop seeds, weed seeds, broken seeds, dirt, etc. This is of great importance, and only seed of the very highest purity should be used. The Seeds Act, 1920, provides that sellers of the most important agricultural seeds shall always declare the purity of these seeds: in the case of vegetable and root seed a standard of purity has been fixed (97 per cent.), but in the case of grasses and clovers the actual figure must be stated. When purchasing seed farmers should demand to know the purity. Two other points are provided for by the Seeds Act:—(1) the presence of certain weed seeds, described as injurious weed seeds, if in excess of 1 per cent. in clovers or 2 per cent. in grasses, must always be declared. The scheduled injurious weeds are docks, sorrel, soft cranesbill, cut-leaved cranesbill, soft brome grass, Yorkshire fog, and wild carrot. (2) The presence of dodder, which must be declared if in excess of one seed in a 4-oz. sample. Dodder is a parasitic plant which lives on clover and very speedily destroys any clover plant that it attacks.

Good Germination.—A high percentage of germination is very desirable. It is unreasonable to suggest that if the percentage of germination is only 50 per cent. twice as much seed may be sown. This plan is very costly, while a low germination frequently indicates poor vitality, which will enable weeds to establish themselves before the crop. This will very much weaken, if not entirely destroy it.

By the Seeds Act the seller is required to state the actual percentage of germination, or where a standard is fixed, a statement that the seed is above the authorised minimum percentage is sufficient, provided that the authorised minimum figure be stated.

Country of Origin.—This is especially of importance in the case of clover seed, which is imported into this country from numerous places—France, America, Canada, Chili, Silesia, New Zealand.

Good English seed is usually insufficient to meet actual requirements and is dearer than other seed. It is the most suitable to use in almost all parts of England. Foreign seed often looks a better sample than English, and may have a somewhat higher percentage of germination, and the price being lower it seems an attractive purchase, but in the English climate a better plant will

usually be obtained from English seed. Care should be taken to observe that the country of origin is stated when buying clovers and grasses, as is required by the Seeds Act. In short, to obtain the best chance of a good crop, three factors bearing on the seed used must be borne in mind:—

(1) Experiments made by the farmer himself, or by others, must be studied to determine the most suitable variety.

(2) Only seedsmen on whom one can rely should be dealt with.

(3) The analysis required by the Seeds Act should be read and the information it gives should be used.

Farmers might usefully have seeds tested at the Official Seed Testing Station, before sowing. Particulars as to size of sample, where to send it and fees for testing, may be obtained from the Chief Officer, Official Seed Testing Station, Huntingdon Road, Cambridge. Full details of the Seeds Act may be obtained by purchasing the Seeds Act, 1920, and the Seeds Regulations, 1922, price 3d. each, from any newsagent. Special facilities are provided for the testing of seeds for farmers when the analysis is required solely for the farmers' own information, and not in connection with a sale of seeds. The fee charged in this case is the nominal one of 6d. per sample.

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SPRING-TAILS ATTACKING MANGOLDS.

*From the Ministry's Pathological Laboratory,
Harpenden, Herts.*

AMONGST the various types of diseased and damaged mangolds submitted during the current season to the Ministry's Pathological Laboratory for diagnosis, there was one affecting seedling plants that calls for special mention, as, though not uncommon in previous years, it has not been certainly attributed to any definite cause.

The injury to the young plant would give the impression that the root had been constricted at the soil level, just below the crown, the crown itself and the remaining root below ground being of more or less normal development. This apparent constriction frequently increases in intensity until the affected portion becomes threadlike, and in the process of singling or

during a high wind the top portion of the plant becomes separated from the lower.

To avoid confusion it is also necessary to mention a not dissimilar type of damage where the root *below* ground becomes threadlike, the portion above remaining intact. The cause of this damage is well known, however, being due to the attack of a minute beetle, *Atomaria linearis*.

As a result of an investigation in a field of attacked plants exhibiting the type of damage first mentioned—a threadlike condition of the root above ground—very large numbers of a minute Spring-tail (*Collembola*) were found to be present upon the plants and surrounding soil, while many of the insects were seen to be feeding upon the mangolds at the affected parts and causing quite a conspicuous bleeding.

Collembola are primitive insects without wings, and the particular members of the Order (*Bourletiella hortensis*, Fitch = *pruinus*, Tulb.) in question are very small slate-coloured globular creatures capable of leaping considerable distances. They immediately scatter when the plants are approached. This, in conjunction with their small size, probably accounts for their not having been hitherto associated (according to the literature so far consulted) with the particular form of damage done, as no plant on being handled for examination would reveal a specimen.

It should be added that, although it is extremely probable that these insects are the first and only cause of the threadlike condition of young mangold plants above ground, this has not been definitely proved. These observations are made rather as giving a possible clue and to promote further investigation by those interested, than to suggest that a final settlement of the problem has been arrived at.

Bourletiella (*Smynthurus*) *hortensis* has previously been reported as injuring various crops, including mangolds, in this country and abroad, but does not appear to have been associated with the particular form of damage under consideration.

As the insects never feed on a root below ground level, it is probable that, when feasible, earthing up the seedling plants so that no roots are exposed would tend to ward off an attack. It is noteworthy that varieties of mangolds are susceptible according to the amount of exposed root exhibited above ground in the early stages of growth, which appeared on the fields examined to be a characteristic of yellow rather than red mangolds.

LIQUORICE GROWING.

DAVID G. McIVER,
Ministry of Agriculture and Fisheries.

THE Liquorice plant, *Glycyrrhiza glabra*, is a native of North Africa, Southern Europe, and Asia Minor, and is cultivated in France, Italy, Spain, Southern Russia and the United States, and to a slight extent in England. The plant is grown for its root, from which is obtained the liquorice of commerce, chiefly used in medicinal preparations, and also in brewing and flavouring tobacco. In England the home-grown root is almost entirely used for chewing purposes. The cultivation of liquorice in this country is now confined to the district between Pontefract and Knottingley in Yorkshire, although a few years back there were two or three centres near London where it was grown.

The liquorice has been grown in the Pontefract district for several generations, and there is no doubt that the Pomfret Cakes which are made in the district, and which are a liquorice preparation, were originally made from the home-grown root. The Pomfret Cakes of to-day are probably made from the imported article. The Yorkshire-grown liquorice, as already stated, is practically all sold for chewing purposes and is chiefly consumed in the Northern towns, such as Newcastle, Hull, Leeds and Manchester. It has a very definite selling season—the months of October and November—and any roots not sold by the beginning of December are stored in sand until the following season.

The acreage under the crop is gradually diminishing and whereas a few years back there was an acreage of about 200, only a quarter of that area is cultivated now. A deep medium soil, such as is found between Pontefract and Knottingley, is essential for its cultivation as it is impossible to get roots up to 4 ft. in length, and more sometimes, unless the soil has a good depth.

The plants remain in the beds as a rule for four years, although occasionally they are lifted in the third, and sometimes when they have done badly or the market is flat they may be left for five years.

The system of cultivation practised in the Yorkshire district is as follows:—

Little preparation of the ground is necessary because it is usual for one liquorice crop to follow another and as the process

of lifting the roots entails the moving of the soil to a depth of three to four feet it can be readily seen that the ground will be left in a well tilled condition for the next crop.

The soil before planting as a rule receives a dressing of between 30 and 40 tons of manure per acre. Planting takes place during the end of March and early April, the land having previously been worked into flattened ridges about $3\frac{1}{4}$ ft. apart and 4 in. high. Two rows of sets are planted on each ridge, the sets being placed singly 8 in. to 12 in. apart. Planting is done with a dibble. The sets consist of runners which resemble very much the underground stems of the perennial Sunflower, and the crowns of the old plants which have been taken up the previous season. The runner and the crown sets are usually planted alternately, and then covered to a depth of 1 in. to 2 in. with soil.

A wet time after planting usually results in many of the sets rotting and failing to grow, the best results being obtained if the weather continues dry for the first 3 or 4 weeks after planting.

During the season the plants require no attention except keeping free from weeds and cutting down the old stems in the autumn or winter. For the first two years the land is cropped between the ridges with early potatoes, cauliflowers, carrots and other kinds of vegetables. The fourth year the plants are usually lifted, this taking place during October and November. The labour bill in lifting is a heavy item, rarely less than £60 an acre.

Trenches have to be dug 3 to 4 ft. deep along the sides of the rows so that the entire root may be obtained. When removed they are trimmed of the small roots and runners, the crowns removed for future planting, and the roots tied into bundles weighing $3\frac{1}{2}$ lb. each. These are collected and made into bales weighing 1 cwt., and in this condition they are sent to the different markets. The crowns are sorted over, the old or original crown that was planted being cut away, and these together with the small roots are known as offal, and are sent to manufacturing chemists and made into various liquorice preparations. The young crowns together with the runners are retained for planting the next season. The price of the liquorice root varies considerably. At £5 or even £6 per cwt. it is said to yield no profit. A fair price is considered about £8, but during the War much higher prices were realised. For the offal only about 8s. a cwt. is obtained. The weight of baled root obtained per acre is about 2 tons, and of the offal only a few cwt.

It may appear that at £7 to £8 per cwt. liquorice growing is a very profitable crop, but against this must be set the high cost of planting, the interval of four years before any returns are obtained, except from the intercropped vegetable crops the first two years, and the heavy expenses of lifting and trimming the roots. And another point is that there is only a limited demand and this appears to be getting less and less each year.

The question of growing the liquorice root for extraction of the liquorice of commerce, of which thousands of tons are annually imported, has sometimes been raised, but when it is pointed out that imported liquorice, not the root, is on offer at present at £5 a cwt., it will be seen that it is impossible for the English grower to compete since he grows at a loss when he obtains that price for the root. The difference can be better realised when it is stated that 1 cwt. of the root only yields 30 lb. of liquorice.

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THE FIRST YEAR'S WORKING OF THE SEEDS ACT, 1920.

II.

Seed Potatoes.—One of the new features of the Seeds Regulations, 1921, was that in the case of a sale or exposure for sale of seed potatoes, a statement had to be delivered to the purchaser (or exhibited alongside the potatoes when exposed for sale) containing particulars as to the class, variety, size and dressing of the potatoes. As regards the statement of variety, it was laid down that this should not be taken to be incorrectly stated if it were true of 97 per cent. of the total quantity sold or exposed for sale, or, in other words, that an error of 3 per cent. would be allowed. On representations being made by the seed potato trade that it was impossible, during the first year that the Regulations were in operation, to limit the possible error to 3 per cent., the Ministry issued a General Licence authorising the standard of purity to be reduced to 95 per cent. for the 1921-22 season only. In the amended Seeds Regulations, 1922, the sale of a quantity of seed potatoes of less than 97 per cent. purity is authorised provided they are declared to be of “mixed varieties.”

The sale of seed potatoes is similar to that of packeted seed, inasmuch as it is to a large extent undertaken during a few weeks only in the year by a number of persons whose ordinary business has no connection whatever with the seed or

nursery trades. This fact makes it very difficult for the Ministry to bring to the notice of the various sellers their responsibilities under the Act, and still more difficult to detect evasions. A large number of establishments have, however, been visited, and the usual explanations and warnings given. These visits, combined with propaganda work which the Ministry is undertaking in order to make known the requirements of the Seeds Act, have already had very satisfactory results.

The principal errors made by vendors of seed potatoes have been as regards the "size and dressing." This term is described in the Regulations as meaning "the size of the mesh (exclusive of the thickness of the wire) of the riddles through and by which, respectively, the potatoes may be passed and retained." The Regulations concede in the case of seed potatoes sold "as grown" that the size of the mesh of the top riddle need not be stated. There have been a large number of cases in which a substantial proportion of the potatoes were much too large to pass through a mesh of the size declared.

Farmer to Farmer Sales.—One of the greatest difficulties in connection with the administration of the Act is to bring home to farmers their responsibilities when selling seeds to other farmers. When selling seed corn or any of the scheduled kinds of seeds intended for sowing, such as red clover, tares, etc., they are in precisely the same position as the seedsman, and are bound to supply the same guarantee. Thus a farmer selling a sack of home-grown clover seed to a neighbour for sowing should, in the first place, have a sample tested at an Official Seed Testing Station, and supply the buyer with a copy of the result not later than the date on which the seed is delivered.

Various methods have been adopted to bring to the notice of the farmer the benefits which he derives from the operations of the Act when he is a buyer of seeds, and the responsibilities which are his when he is a seller. With the welcome assistance of the National Farmers' Union and other farmers' organisations, a large number of leaflets have been distributed, paragraphs have been inserted in the country newspapers from time to time, and the co-operation of the local Agricultural Education Authorities and the Agricultural Collèges has been enlisted. In referring to the number of farmers' samples sent for testing to the Official Seed Testing Station, the Chief Officer of the Station in his report for the season 1920-21 says:—"In any county the number of farmers using the Station appears to be in direct

proportion to the activities in this connection of the County Agricultural Organiser.”

One of the most hopeful pieces of propaganda work in this connection during the past season has been the series of lectures on the Seeds Act given by the Ministry's inspectors at meetings which it was possible to arrange, thanks to various Branches of the National Farmers' Union, and the Local Education Authorities. In Wales the total number of meetings of this kind attended by the Ministry's Seeds Inspector was 28, spread over eleven different counties. The attendance of farmers at these Welsh meetings was approximately two thousand, but as reports appeared in most of the county papers circulating amongst the farming community, the actual number of farmers reached must have been far greater.

Prosecutions.—Legal proceedings for infringements of the Seeds Act have been taken in four cases during the season 1921-22.

The first case was heard at Harrogate where a firm of seedsmen in the town were charged with making a false statement under the Act in respect of a quantity of onion seed. The germination of the seed in question was stated to be not less than the minimum percentage authorised by the Seeds Regulations, 1921, *i.e.*, 60 per cent., whereas the actual germination was found on an official test to be only 5 per cent. The Bench imposed a fine of £1 1s. and £3 3s. costs.

The second case was in respect of a similar charge against a seedsman at Knaresborough who exposed parsnip seed for sale with a declaration that the germination was at, or above, the authorised minimum, *i.e.*, 45 per cent., but which was shown to be only 27 per cent. The Bench inflicted a fine of £1 and £1 1s. costs.

The third case was heard at Abergavenny, and the defendant pleaded that the seed which was the subject of the prosecution was old and not intended for sale. The Bench decided that, as there was some doubt as to the seeds being exposed for sale, the case should be dismissed. but told the defendant that in their opinion he was to blame for having such old seed on the premises.

The fourth case was heard at Peterborough, the charge being failure to deliver to the purchasers, in the case of two separate sales of seed potatoes, the necessary statement as to class, variety, size and dressing. A conviction was obtained, and a

fine of £1 and costs inflicted in both cases. The costs amounted to £10 in the one case and £5 in the other.

Amendments of Seeds Regulations.—In the light of the experience gained since the Seeds Regulations, 1921, came into operation on the 1st August, 1921, a number of minor amendments were recently agreed to by the Ministry in consultation with representatives of the various interests concerned. These alterations have been incorporated in a new set of Regulations entitled the “Seeds Regulations, 1922,” which came into operation on the 10th August last, superseding the previous Regulations.

Apart from amendments of a purely drafting nature, the alterations have the effect of:—

- (1) Specifically excluding lawn grass seeds from the requirements of the Regulations;
- (2) Withdrawing the necessity for stating the percentage of pure germinating seed or “real value” in the case of grass or clover seed;
- (3) Allowing alsike clover and white clover, when grown together, to be treated, for the purposes of the Regulations, as one seed, provided they are declared as having been grown together;
- (4) Requiring, for the purpose of testing, the sprouted grains of cereal seeds not to be treated as an impurity, that is to say they are not to be picked out of the sample put up for the germination test;
- (5) Reducing the authorised minimum percentages of germination in the case of broccoli and cauliflower from 65 to 60; and
- (6) Authorising the sale of seed potatoes, the variety of which is less than the standard purity of 97 per cent., provided they are specifically described as being of mixed varieties.

Copies of the Seeds Act, 1920, and of the Seeds Regulations, 1922, may be obtained through any bookseller, or direct from H.M. Stationery Office, Imperial House, Kingsway, W.C., price 3d. each.

* * * * *

NOTES ON MANURES FOR DECEMBER.

SIR JOHN RUSSELL, D.Sc., F.R.S.,

Rothamsted Experimental Station, Harpenden, Herts.

Does Manuring pay? A further Example.—In last month's notes the question was raised whether manuring pays, and the answer was given that it does when it is properly carried out. Assuming that a farmer can grow a crop at all at present prices he will make more out of a good crop than of a poor one. It is quite fallacious to suppose that under-production on British farms would help farmers by forcing up prices or in any other way; it would simply result in more imports. Nor is there any reason why farmers should despair and give up because of the difficult times through which they are now passing. Last month an instance was given showing that the best return to the farmer is obtained when a bold policy is adopted and the fertiliser dressing is not too stinted.

This is shown by the following experiment on potatoes carried out this season at Rothamsted :—

	Yield per acre. tons.	Increase due to each additional $1\frac{1}{2}$ cwt. sulphate of ammonia. tons per acre.
10 tons farmyard manure : phosphates and potash and—		
No nitrogenous manure ...	6.0	—
$1\frac{1}{2}$ cwt. sulphate of ammonia	7.5	1.5
3 " " "	9.4	1.9
$4\frac{1}{2}$ " " "	9.7	0.3

As in the cases previously quoted, the double dressing of sulphate of ammonia has given more than double the return of the first; $1\frac{1}{2}$ cwt. sulphate of ammonia gave an additional crop of $1\frac{1}{2}$ tons per acre of potatoes, while 3 cwt. gave an additional 3 tons 8 cwt. per acre. Now the price of 3 tons 8 cwt. of potatoes is not yet anything like as low as that of 3 cwt. of sulphate of ammonia, even after the cost of lifting, storing, marketing, etc., is thrown into the account.

The experiment illustrates the undoubted truth that, after a certain point is reached, further additions of fertiliser do not continue to increase the yield of crop at the same rate, although the increase may still be profitable. In the present instance a further $1\frac{1}{2}$ cwt. sulphate of ammonia (making $4\frac{1}{2}$ cwt. in all) gave a further increase of 6 cwt. of potatoes per acre over that given by 3 cwt.: this is a small but by no means negligible

result. Obviously, however, the main effect is produced by the $1\frac{1}{2}$ or 3 cwt. per acre, and further additions of manure might well prove to be unprofitable.

The evidence indicates that there are two distinct sets of maximum returns for successive increments of manures:—a maximum increment of crop which is given not necessarily, and probably not usually, by the first, but by the second or some subsequent increment of manure; and a maximum of profit which may be obtained with some particular increment of manure.

Effect of Potassic Fertilisers on Clover.—One of the most striking results at Rothamsted this year was the effect of potassic fertilisers in increasing the yield of clover in a pure red clover ley. The plant to begin with was poor; it was kept over from the 1920 sowing and left to stand after being cut in 1921 because the young seeds of that year completely perished in the drought. It was sufficiently good to save under the circumstances, but was not very vigorous. The results of treating it with fertilisers showed that slags of various kinds gave no improvement, but potassic fertilisers improved the yield. The results were:—

Clover hay : cwt. per acre.

No added manure ...	...	...	...	17·0
Basic slag ...	...	...	...	17·0
Sulphate of potash...	...	...	...	23·2

an increase of over 6 cwt. of clover hay per acre for an addition of 1 cwt. of sulphate of potash.

Apparent Failure of Basic Slag on Grass Land.—Cases have recently been reported in which farmers applied basic slag to grass land last winter, but have seen no result. The past season was not very favourable to slag, and in the Rothamsted experiments slag gave very little result. The cold spring was unfavourable to growth in many districts, and it was not till the end of May that the grass began to make much growth: it then came on with a rush. In these circumstances the slag does not seem to have exerted its effect, and only one of the various samples tested in the field at Rothamsted gave any marked increase.

There are, however, cases where even in good seasons slag does not act as well as it might be expected to do. Some of these were mentioned in last month's notes: they were cases in which lime was needed before the slag could act. Another possibility is suggested by the clover experiment just mentioned: here slag by itself was without action in increasing the growth of clover, though potash was effective. It is possible, therefore, that some

of the cases of apparent inertness of slag may be due to shortage of potash. It has long been known that this happens on light soils, though here the increased yield of hay or of grazing vegetation may be too small to justify the expenditure incurred in securing it; but it has not before been suspected that a shortage of potash might occur on heavy soils, and this possibility is therefore being tested at Rothamsted during the coming season.

Does Superphosphate use up the free Lime in a Soil?—A correspondent asks the following question:—If a sample of superphosphate contains a certain amount of combined lime can it be assumed that an equal amount will be withdrawn from the reserves in the soil when the superphosphate reverts, as it is supposed to do, directly it is put on the land?

The question is difficult to answer because the changes occurring when superphosphate is added to soil, and again when it is taken up by the plant, are very complex and cannot be set out in any simple way. Undoubtedly the superphosphate becomes insoluble and to this extent might be expected to combine with and therefore withdraw from the soil a certain proportion of its basic material including the free lime; but the amount withdrawn is really small, even if one supposed that the whole burden falls on the lime. Only a fraction of the total lime is involved in any case; much of it is in the form of calcium sulphate which does not react with lime; the active part is the mono-calcium phosphate, and the lime with which this can react does not amount to more than 5 or 6 per cent. of the weight of the superphosphate, according as the sample is of 26 or 30 per cent. strength; in other words, a dressing of $2\frac{1}{2}$ cwt. of superphosphate would withdraw from the soil less than 15 to 20 lb. of lime per acre. It is improbable, however, that all the burden falls on the lime in the soil.

Town Refuse as Manure: further Instances.*—A test of town refuse has been made this season at Rothamsted. Three plots were laid out on the mangold field: one was given London stable manure at the rate of 10 tons per acre, and the other two received town refuse sent from Hampstead by the contractors. In addition artificials were supplied at the rate of 3 cwt of superphosphate and a mixture of muriate and sulphate of ammonia equivalent to 3 cwt. of sulphate of ammonia. No differences were observed between the three plots at any time, and in the end the yields of roots were equal within the errors of experiment, there being 22 tons per acre on the straw manured plots and 23 tons

* See this *Journal*, November, 1922, p. 685.

on the plots receiving town refuse. The crop is not large and the season was not particularly favourable to farmyard manure. The result is nevertheless interesting. It still remains to be determined whether the effect of town refuse in the second and later seasons is equal to that of farmyard manure.

Some further analyses of town refuse are as follows :—

				<i>Letchworth</i> per cent.	<i>Colwyn Bay</i> per cent.
Mineral matter	...	...	...	41·34	42·4
Organic matter	...	...	...	32·49	19·05
Moisture	...	...	...	24·14	38·56
Nitrogen	...	...	...	0·33	0·78
Phosphoric acid (P ₂ O ₅)	...	...	...	0·33	1·26
Equal to Tricalciophosphate	...	...	...	0·72	2·75
Calcium oxide	...	...	...	—	2·42
Calcium carbonate	...	...	...	6·87	—
Oxides of iron and alumina	...	...	...	7·87	10·20

Prices of Artificial Manures.

Unless otherwise stated, prices are for not less than 2-ton lots f.o.r. in towns named, and are net cash for prompt delivery.

DESCRIPTION	Price per ton				Cost per Unit at n on
	Bristol	Hull	L'pool	ndn	
	£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of Soda (N. 15½ per cent.)	...	...	13. 0	13. 7	17. 3
Sulphate of Ammonia, ordinary					
(A. 25¼ per cent.)	15.10*	15.10*	15.10*	15.10*	(N)14.11
" " neutral					
(A. 25¾ per cent.)	16.13*	16.13*	16.13*	16.13	(N)15.8
Kainit (Pot. 12½ per cent.)	...	...	2.12	2. 7	3. 10
French Kainit (Pot. 14 per cent.)	2 10	2. 1		2.12	3. 9
Sylvinit (Pot. 20 per cent.)	...	...		3. 5	3. 3
Potash Salts (Pot. 30 per cent.)	...	...		5. 2	3. 5
Muriate of Potash (Pot. 50 per cent.)	...	10.10	8.10	9. 5	3. 8
Sulphate of Potash (Pot. 48 per cent.)	...	11.15	12. 0	12. 0	5. 0
Basic Slag (T.P. 30-32 per cent.)	3.17§	...	...	4. 2§	2. 8
" " (T.P. 24-26 per cent.)	...	3. 1§			...
" " (T.P. 20-22 per cent.)	2.15§	2.13§	2.15§	2.15§	2. 7
" " (T.P. 16-18 per cent.)	2. 5§	...	2.11§	2.13§	3. 2
Slag Phosphate (T.P. 60 per cent.)	6. 7§	...		6.17§	2. 3
" " (T.P. 50 per cent.)	...	...	6.12§	5.17§	2. 4
" " (T.P. 40 per cent.)	4. 7§	...		4.17§	2. 5
Superphosphate (S.P. 35 per cent.)	4. 9	...	4.15§	4. 5	2. 5
" " (S.P. 30 per cent.)	3.16	3.10	4. 2§	3.15	2. 6
Bone Meal (T.P. 45 per cent.)	9 10	9 10†	9. 0	9. 0	...
Steamed Bone Flour (T.P. 60 per cent.)	8.10†	8. 5†	8. 5	7. 7	...
Fish Guano (A. 9-10, T.P. 16-20 per cent.)	12 15	...	12. 5	12. 7	...

Abbreviations : N.=Nitrogen ; A.=Ammonia ; S.P.=Soluble Phosphate ; T.P.=Total Phosphate ; Pot.=Potash.

* Delivered in 4 ton lots at purchaser's nearest railway station.

† Delivered (within a limited area) at purchaser's nearest railway station.

§ Prices include cost of carriage from works to town named. Cost to purchasers in other districts will be greater or less according to the distance of different purchasers from the works.

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NOTES ON FEEDING STUFFS FOR DECEMBER.

E. T. HALNAN, M.A., Dip. Agric. (Cantab.),
Ministry of Agriculture and Fisheries.

How to use the Feeding Stuffs Table.—Several correspondents have asked for information as to the method of using the table given every month in these notes, and it may be useful to repeat here notes that have been given at different times in previous issues.

It will be noted that the table contains two sections. The first deals with the actual current wholesale prices at markets, and the second gives an estimate of the values for feeding on the farm home-grown feeding stuffs.

Market Prices.—When a farmer feeds a purchased cake or feeding stuff to stock, a certain amount of the nitrogen, potash and phosphates in that feeding stuff finds its way into the urine or the dung and is used for manuring the ground. A feeding stuff when purchased therefore has a manurial value as well as a feeding value, so that in comparing the feeding values of any purchased cakes we have to take into consideration the manurial value. In the table given, the manurial value of the cake or feeding stuff is first assessed from the current prices of artificial manures and this figure is subtracted from the price per ton of the feeding stuff. This gives the cost of the food value per ton of the feeding stuff. Now the starch equivalent figure given in the fifth column of the table gives as accurate a figure of the feeding value of the feeding stuff as is required for all practical purposes. The cost of the food value is therefore divided by the starch equivalent figure, and this gives the cost per food unit. The cheapest feeding stuff is the feeding stuff which is the cheapest per unit of starch equivalent. Thus, in this month's table wet porter grains prove the cheapest feeding stuff available where local conditions allow its ready transport. American oats are also much cheaper than Canadian, Scotch, or English oats.

Several correspondents have mentioned from time to time that the prices given in this table differ from the prices current on local markets. This is admittedly so, and for this reason the method of working out the unit value of a feeding stuff is given in the footnote to the table. This enables a farmer to

DESCRIPTION.	Price per Qr.		Price per Ton.		Manurial Value per Ton.	Cost of Food Value per Ton.		Starch Equiv. per 100 lb.	Price per Unit, Starch Equiv.	Price per lb. Starch Equiv.
	s.	lb.	£	s.		£	s.			d.
Wheat, British -	45/6	504	10	2	0 18	9	4	71.6	2/7	1.38
Barley, British Feeding	32/6	400	9	2	0 14	8	8	71	2/4	1.25
„ Canadian No. 3 Western	35/-	400	9	16	0 14	9	2	71	2/7	1.38
Oats, English White -	36/-	336	12	0	0 16	11	4	59.5	3/9	2.01
„ „ Black & Grey	31/-	336	10	7	0 16	9	11	59.5	3/3	1.74
„ Scotch White	38/-	336	12	13	0 16	11	17	59.5	4/0	2.14
„ Canadian No. 2 Western	34/-	320	11	18	0 16	11	2	59.5	3/9	2.01
„ „ No. 2 Feed	31/6	320	11	0	0 16	10	4	59.5	3/5	1.83
„ American -	29/-	320	10	3	0 16	9	7	59.5	3/2	1.70
„ Argentine -	30/-	320	10	10	0 16	9	14	59.5	3/3	1.74
Maize, Argentine -	42/-	480	9	16	0 15	9	1	81	2/3	1.20
„ American -	41/-	480	9	11	0 15	8	16	81	2/2	1.16
„ South African -	41/-	480	9	11	0 15	8	16	81	2/2	1.16
Beans, English Winter	51/-	532	10	15	1 17	8	18	67	2/8	1.43
„ Rangoon -	8/6	112	8	10	1 17	6	13	67	2/-	1.07
Peas, English Dun	60/-	504	13	7	1 13	11	14	69	3/5	1.83
„ „ Maple	85/-	504	18	18	1 13	17	5	69	5/-	2.68
Rye, Home-grown	34/-	504	7	11	0 18	6	13	71.6	1/10	0.98
Millers' offals—										
Bran, British -	—	—	6	10	1 12	4	18	45	2/2	1.16
Broad Bran -	—	—	7	10	1 12	5	18	45	2/7	1.38
Fine middlings (Imported)	—	—	9	7	1 6	8	1	72	2/3	1.20
Coarse middlings (British)	—	—	8	12	1 6	7	6	64	2/3	1.20
Pollards (Imported)	—	—	7	5	1 12	5	13	60	1/11	1.03
Barley Meal -	—	—	11	0	0 14	10	6	71	2/11	1.56
Maize „ -	—	—	10	10	0 15	9	15	81	2/5	1.29
„ Germ Meal -	—	—	10	10	1 2	9	8	85.3	2/2	1.16
„ Gluten-feed -	—	—	9	10	1 12	7	18	75.6	2/1	1.12
Locust Bean Meal	—	—	8	15	0 11	8	4	71.4	2/4	1.25
Bean Meal -	—	—	13	10	1 17	11	13	67	3/6	1.87
Fish „ -	—	—	14	0	5 1	8	19	53	3/5	1.83
Linseed -	—	—	21	2	1 16	19	6	119	3/3	1.74
„ Cake, English (9% oil)	—	—	14	0†	2 5	11	15	74	3/2	1.70
Cottonseed „ English (5% oil)	—	—	7	15	2 1	5	14	42	2/9	1.47
„ „ Egyptian (5% oil)	—	—	7	15	2 1	5	14	42	2/9	1.47
Soya Bean Cake (6% oil)	—	—	12	5	3 3	9	2	69.1	2/8	1.43
Coconut Cake (6% oil)	—	—	9	0	1 16	7	4	73	2/-	1.07
Palm Kernel Meal (1½-2% oil)	—	—	5	12	1 8	4	4	71.3	1/2	0.62
Feeding Treacle -	—	—	4	10	0 10	4	0	51	1/7	1.85
Brewers' grains, dried, ale	—	—	7	15	1 8	6	7	49	2/7	1.38
„ „ „ porter	—	—	7	5	1 8	5	17	49	2/5	1.29
„ „ „ wet, ale	—	—	1	5	0 11	0	14	15	-/11	1.49
„ „ „ wet, porter	—	—	0	18	0 11	0	7	15	-/6	0.27

† At Liverpool.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of October and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative prices of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, suppose coconut cake is offered locally at £10 per ton. Its manurial value is £1 16s per ton. The food value per ton is therefore £8 4s. per ton. Dividing this figure by 73, the starch equivalent of coconut cake as given in the table, the cost per unit of starch equivalent is 2s. 3d. Dividing this again by 22.4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1.21d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own market.

ascertain for himself the cheaper of any two feeding stuffs offered him, and he can then decide whether the difference in condition and quality of sample justifies the difference in the price asked. The chief object in view in publishing this table is to draw attention to the kind of feeding stuffs which are on offer at low values and likely to prove an economical purchase to the farmer.

Farm Values.—The second section of the table deals with the estimated value of home-grown produce on the farm. In this case, the reader should look at the price per ton of the feeding stuff and compare it with the price per ton offered him for sale. If the price per ton offered for his home-grown products shows a profit after allowing for cartage charges and buying in fresh feeding stuffs, it will be an advantage to sell off these products and buy in feeding stuffs. If, on the other hand, such a procedure shows a loss, it will prove a more profitable transaction to feed off the home-grown product rather than sell it. It will be noted, for instance, that wheat, oats and barley still show a distinct margin of profit if sold off rather than kept for feeding, except in the case of middlings which is distinctly dearer than the farm value of wheat. In the case of barley, too, it would be an unprofitable transaction to sell off barley at £9 2s. a ton and buy in barley meal at £11 a ton.

FARM VALUES.	Value per Ton on Farm.	Manurial Value per Ton.	Food Value per Ton.	Starch Equivalent per 100 lbs.	Value per unit S.E. s. d.	Market Value per lb. S.E. d.
	£ s.	£ s.	£ s.			
Wheat - - - - -	8 13	0 18	7 15	71·6	2/2	1·16
Oats - - - - -	7 5	0 16	6 9	59·5	2/2	1·16
Barley - - - - -	8 8	0 14	7 14	71·0	2/2	1·16
Potatoes - - - - -	2 3	0 4	1 19	18·0	2/2	1·16
Swedes - - - - -	0 18	0 3	0 15	7·0	2/2	1·16
Mangolds - - - - -	0 16	0 3	0 13	6·0	2/2	1·16
Good Meadow Hay - - -	4 16	0 16	4 0	31·0	2/7	1·38
Good Oat Straw - - -	2 12	0 8	2 4	17·0	2/7	1·38
Good Clover Hay - - -	5 7	1 4	4 3	32·0	2/7	1·38
Vetch and Oat Silage - -	2 2	0 9	1 13	14·0	2/4	1·27

THE Ministry has decided to extend the scope of its Register of Dairy Cows by including additional Sections as indicated below.

**Register of
Dairy Cattle.**

These additions will, it is hoped, enhance the usefulness and value of the Register.

The Volume No. VI., for the year ending 1st October, 1922, will accordingly be known as the Ministry's "Register of Dairy Cattle," and will comprise:—

Section I. : Dairy Cows—

(a) With certified milk records of prescribed yields (*i.e.*, 8,000 lb. for one year, or 6,500 lb. average for two or more consecutive years) for the year ending 1st October, 1922;

(b) In respect of which Certificates of Merit have been awarded.

The object of Certificates of Merit is to encourage Dairy Farmers to retain in their herds cows which, in addition to being heavy milkers, are also regular breeders. Certificates of Merit will be issued on application from owners in respect of cows which have been entered in the Register for three consecutive years, and which during those three years have yielded not less than 24,000 lb. of milk and calved not less than three times.

Section II. : Pedigree Bulls for Dairy Herds—

(a) Whose dams and sires' dams have been entered or accepted for entry in the Ministry's Register of Dairy Cattle; or

(b) Having two or more daughters entered or accepted for entry in the Ministry's Register of Dairy Cattle.

The object of this Section of the Register is to encourage dairy farmers to use pedigree bulls bred from milking strain, or those whose female progeny have proved to be satisfactory dairy cows, and also to provide dairy farmers with a list of such bulls, together with the names and addresses of their breeders and owners.

The Ministry desires to direct attention to the fact that the price of Volume V. of the Register of Dairy Cows for the year ended 1st October, 1921, which will be ready shortly, has been reduced to 2s. 6d. net, post free. Applications for copies should be addressed to the Secretary, Ministry of Agriculture and Fisheries, Whitehall Place, S.W.1. Remittances should be by Postal Order, Money Order or Cheque, made payable to the Secretary, Ministry of Agriculture and Fisheries, and crossed "Bank of England."

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RECENT observations concerning the prices obtained by growers for dessert apples when properly graded and packed, in comparison with similar fruit marketed in the more usual way, have brought out some facts which illustrate the profitability of the better method.

Prices of Apples.

A record crop of Worcester Pearmain, grown in Gloucestershire, was sent to Manchester and Birmingham markets in the British Standard boxes containing 40 lb. of fruit. The average price per box including first and second grade fruit so marketed was 15s.

Some pots of the same variety and quality, but ungraded and loose, were sent to the Cheltenham Fruit Market in the ordinary way. The price realised for these was 6s. 3d. per 56-lb. pot, or $1\frac{3}{4}$ d. per lb., compared with $4\frac{1}{2}$ d. per lb. obtained in the other markets for the boxed fruit.

Even when the supply of box wood had run out and a consignment was sent in 56-lb. wickers, *well graded and properly packed*, to the salesman who had sold the boxes, the price continued to be $4\frac{1}{2}$ d. per lb., or 21s. per pot. The salesman pointed out that the excellent prices were maintained solely because the grower's reliable packing was already known in the market.

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IN connection with the Farm Competitions organised by the Essex Agricultural Society, with a view to improving cultivation

Small Holdings in Essex.

and stimulating production on farms and small holdings in Essex, several prizes, given by the Hon. E. G. Strutt, C.H., President of the Society, were offered this year for the best cultivated County Council Small Holdings. There would appear to have been keen competition for the prizes. Thirty-three smallholders entered in the class for holdings under 15 acres, and forty-one for that limited to small holdings over that acreage. Five prizes were awarded in each class, and in addition thirteen entrants who came just below prize merit were "commended," one being "highly commended."

In the course of some general remarks on the holdings inspected and on the work of the Small Holdings Committee, the judges made the following observations:—

"With regard to the land acquired by the Committee for Small Holdings, we were most favourably impressed with its quality and suitability for the purpose. In these respects the

land far exceeded our expectations, and was indeed a most pleasant surprise, as we had often heard disparaging reports of it. This remark has special emphasis in the case of the Boxted, Beaumont, and Eastwoodbury Settlements, where the land appeared to us to be admirably suited for the purpose for which it was purchased.

“ Bearing in mind the fact that it would certainly be some of the best cultivated holdings which would be entered for competition, we must say that we were pleased with many of the holdings we inspected. In some cases where knowledge, ability, industry, and physical strength are all combined in a man and his family, we saw the most gratifying and satisfactory results, though at the cost of strenuous labour and long hours of toil, such as few farm labourers would care to put in.”

There is no doubt that these competitions must have a very beneficial effect on the cultivation of holdings throughout the county, and it is very gratifying that experienced farmers should be able to report so favourably on the results of the efforts of the Small Holdings Committee and their tenants.

* * * * *

POULTRY-KEEPERS who have large stocks are advised to keep in mind the possibility of marketing poultry feathers. From

Market for Poultry Feathers. information which the Ministry has obtained from various sources, it appears that large quantities of poultry feathers are annually imported from China, United States, France, and Portugal, and that some are exported from this country to the Colonies. The weights and values of these imports in 1913 were 45,016 cwt. at £159,366; in 1919, 52,468 cwt. at £284,791; and in 1920, 79,115 cwt. at £587,516.

English feathers are usually regarded in the Trade as inferior to the best imported kinds on account of the fact that when marketed they are not so free from dirt and impurity. Feathers for sale should be clean, and should be graded both as regards colour and quality as they are plucked. White and light-coloured feathers are the best, and fowl feathers should be kept separate from those of ducks and geese, as the feathers of the latter are of much greater value. The different kinds might be loosely packed in muslin or scrim bags and hung up in a dry place out of reach of any ground damp. The quill feathers, which are of less value, should never be mixed with the smaller feathers.

Consignments of 5 cwt. and upwards are easily disposed of to feather merchants, and smaller quantities can often be sold privately, and possibly better prices obtained than the merchant will give. A list of names of dealers in feathers can be had on application to the Ministry, 10, Whitehall Place, S.W.1.

* * * * *

Potatoes.—At the end of October probably about three-fourths of the potatoes had been lifted in the country as a whole.

**Probable Yield
of Potato and
Root Crops.**

Weather conditions had been favourable and the tubers stored in dry condition. The crop is healthy and the tubers mostly large, though there are occasional reports of disease and damage by slugs. Heavy crops will be obtained in all parts of the country except in the north-west, where they are considered about average. The yield per acre was estimated on 1st November at 7 tons per acre, or 1 ton per acre above average, which would give a total production of about 3,920,000 tons in England and Wales against 2,960,000 tons last year.

Roots.—The pulling and storing of mangolds was in progress at the end of October, and in some districts the bulk of the crop had been harvested. Yields well over the average will be obtained in the east and south-east, but in other parts of the country the roots are mostly small and yields somewhat below average are expected in the north and in Wales. Turnips and swedes are rather small in most districts. These crops also have done best in the east and south-east, whilst in the north-west and in Wales under average yields are expected. The yields per acre of both mangolds, turnips and swedes over the whole country are expected to prove about 7 per cent. above average, mangolds being forecasted at rather more than 20 tons and turnips and swedes at slightly over 13 tons per acre. These yields would give a total production of mangolds of 8,500,000 tons against 6,250,000 tons last year, and of turnips and swedes 10,860,000 tons against 6,600,000 tons in 1921.

The appearance of the potato and root crops on 1st November indicated probable yields per acre as shown in the table below. These forecasts, however, are not based on detailed inquiries such as are carried out in connection with the final estimates of yield issued after harvest, and therefore have not the same degree of accuracy. It should also be borne in mind that the

actual yields may be affected by weather conditions after 1st October :—

<i>Countries.</i>	<i>Potatoes.</i>		<i>Turnips and Swedes.</i>		<i>Mangolds.</i>	
	Forecast, Ten Years'		Forecast, Ten Years'		Forecast, Ten Years'	
	1922. Tons.	Average. Tons.	1922. Tons.	Average. Tons.	1922. Tons.	Average. Tons.
Eastern ...	6·9	6·0	13·5	10·3	21·3	16·7
North-Eastern ...	7·8	6·2	12·7	11·0	19·5	17·8
South-Eastern ..	7·3	5·7	14·2	10·9	21·6	18·7
East Midland ...	6·6	5·5	10·6	11·1	18·1	18·1
West Midland ...	7·0	5·8	13·4	13·5	22·6	21·7
South-Western...	6·5	5·5	13·8	12·8	21·5	21·5
Northern ...	6·0	5·2	14·7	12·9	15·1	16·5
North-Western...	6·9	6·8	13·5	16·7	18·6	21·0
North Wales ...	6·4	5·3	11·7	14·6	15·5	17·2
South Wales ...	6·9	5·3	11·5	14·1	15·9	17·0
ENGLAND AND WALES	7·0	6·0	13·2	12·3	20·2	18·7

* * * * *

THE Ministry and the Royal Horticultural Society have set up a Joint Committee to administer a scheme for the official

**Test of Varieties
of Fruit for
Commercial
Purposes.**

testing of new varieties of fruit for commercial purposes. Under the scheme the Royal Horticultural Society's Gardens at Wisley will serve as the Central Station, at which all varieties will be tested in the first instance. In later years varieties selected as showing merit will be sent for further testing to sub-stations which the Committee hope to establish in various fruit districts throughout the country.

Tests will be confined for the present to hardy fruits—apples, pears, plums, cherries, gooseberries, currants, raspberries, strawberries, etc., and also nuts.

The Committee is now prepared to receive applications for the reception of plants, buds, and grafts sufficient to allow the following number of trees, bushes and plants to be grown of each variety :—

Apples and pears	...	...	...	20 Half standard.
			plus	20 Bushes.
Plums, cherries and nuts	...	...	...	10 Half standard.
Currants, gooseberries, raspberries				
and other berries	...	...	...	20 Bushes.
Strawberries	...	...	...	100 Plants.

Buds or grafts will be worked on approved stocks.

In no circumstances will the central station or a sub-station permit trees, buds or grafts to be taken off the station.

The Committee will, after a consideration of the reports of the recording staff and selected specialists, issue reports in which recommendations of special varieties will be made. No report on a variety will, however, be issued until sufficient time has elapsed to enable a fair test to be carried out.

The Committee for this purpose consists of :—

- | | |
|--|---|
| Professor W. Bateson, F.R.S. (Chairman). | |
| Mr. W. G. Lobjoit, O.B.E., J.P. | } Appointed by the
Ministry of Agriculture. |
| Mr. H. V. Taylor, M.B.E., B.Sc. | |
| Mr. J. C. F. Fryer, M.A. | |
| Professor B. T. P. Barker, M.A. | |
| Mr. G. W. Leak. | |
| The Chairman of the Wisley Committee. | } Appointed by the
Royal Horticultural
Society. |
| The Director of Wisley. | |
| The Chairman of the Fruit Committee. | |
| Mr. E. A. Bunyard. | |
| Mr. Cuthbert Smith. | |

All communications concerning the scheme should be addressed to The Director, Royal Horticultural Society Gardens, Wisley, Ripley, Surrey.

* * * * *

THE Ministry announces that as from 1st January, 1923, it will no longer be able to supply Anti-Swine-Fever Serum for the treatment of pigs in order to protect them from infection of Swine Fever.

**Serum Treatment
for Swine Fever.**

This material has hitherto been supplied by the Ministry free of charge, to owners of pigs in cases suitable for the adoption of this method of preventing the spread of disease to apparently healthy pigs on premises where swine fever has broken out. The method is only relatively inexpensive, and its value depends upon the conditions under which it can be applied in practice. The Ministry has found, however, as the result of experience, that owing to the difficulty of getting in touch with outbreaks before infection has made considerable inroads among the stock, successful results in connection with preventive treatment are greatly interfered with. Having regard to this and to the necessity for economy, it is considered advisable to discontinue serum treatment until such time as a safe method of giving permanent, in place of temporary, immunity has been worked out.

The Ministry will be prepared, through its Inspectors, to advise owners of pigs concerned in an outbreak, whether their individual

cases are more favourable than usual, for the application of serum as a temporary preventive, and will also advise them how the serum can be purchased on the market if desired.

* * * * *

THE importation of onion and leek seed into this country is subject to the provisions of the Destructive Insects and Pests (Importation of Onion and Leek Seed)

Importation of Onion and Leek Seed. Order, 1922, and all consignments should be inspected in the country of origin before shipment, and certified to be free from disease.

Large quantities of this seed are imported from the United States, and as a result of representations made by the Controller of Horticulture during his recent visit to Washington, it is understood that the American authorities propose to arrange for the examination, while growing, of onion and leek crops intended for the production of seed for export. It is probable that the American authorities will refuse to grant certificates for seed from crops which have not been inspected whilst growing, and importers should therefore take immediate steps to warn their growers in America to ask for the inspection of onion and leek crops now being grown for the production of seed for export to this country.

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Conciliation Committees in Agriculture.

THE following further agreements have been made by Conciliation Committees during the past month:—

<i>Details.</i>				
<i>Area.</i>	<i>Period.</i>	<i>Age.</i>	<i>Wage.</i>	<i>Remarks.</i>
Cheshire -	- 24th Oct., 1922, to 30th April, 1923	21 & over	32/- for guaranteed week of 54 hrs. Overtime 9d. per hr.	Proportionate rates for male workers under 21 years.
Derby -	- 1st Oct., 1922, to 31st Dec., 1922	do.	7d. per hr. on weekdays and 9d. per hr. on Sundays	—
Devon -	- 30th Oct., 1922, to 31st Dec., 1922, and onward to Lady Day, 1923, unless notice of revision is given by either side	do.	30/- for week of 50 hrs. Overtime 8d. per hr. on weekdays and 10d. per hr. on Sundays	Proportionate rates for male workers under 21 and special rates for female workers The overtime rates operate until Lady Day, 1923

Area.	Period.	Details.		Remarks.
		Age.	Wage.	
Lancs., S.	- To 31st Dec., 1922	21 & over	37/6 for week of usual hrs.	—
Lancs., N.	- To 31st Jan., 1923	do.	37/6 for week of usual hrs.	—
Lancs., E.	- To 30th April, 1923	do.	40/- for week of usual hrs.	—
Loughborough	From 4th Nov., 1922, until a fortnight after notice of cancellation is given by either side	do.	32/- per week of 52 hrs. Overtime 7d. per hr. on weekdays, 9d. per hr. on Sundays	—
Shropshire	- From 1st Nov., 1922, to 24th Feb., 1923	do.	7d. per hr. for guaranteed week of 48 hrs. Overtime 7d. per hr. on weekdays, 9d. per hr. on Sundays	Proportionate rates for male workers under 21 years of age
Yorks. East Riding	From 28th Oct., 1922, to 29th Dec., 1922	do.	30/- per week	- Female and childrenworkers 2/6 per day
Cardigan-	- 13th Nov., 1922, to 13th Nov., 1923, but subject to revision in March, 1923, if either side desires	do.	30/- per week of 54 hrs. in summer and 50 hrs. in winter	Proportionate rates for male workers under 21 years of age
Carnarvon	- From 13th Nov., 1922, to 13th May, 1923	do.	33/- for week of 61 hrs. (including Sunday) to special classes of workers. 30/- for 50 hrs. with overtime at 7d. per hr. on weekdays and 8d. per hr. on Sundays for other workers	Proportionate rates for male workers under 21 years of age
Denbigh and Flint	—	do.	33/- for week of 61 hrs. for stockmen and carters ; 27/- for week of 50 hrs. for other male workers	—

The Committee for the Holland division of Lincolnshire also agreed to extend the period of operation of their last agreement until the 8th November, 1922.

Full particulars of the agreements for any particular area will be furnished on application to the Ministry.

AGRICULTURE ABROAD.

AGRARIAN LEGISLATION IN EUROPE—EXPENDITURE
OF THE U.S.A. DEPARTMENT OF AGRICULTURE—
APPROPRIATIONS FOR AGRICULTURE IN CANADA—
DAIRYING IN NOVA SCOTIA—WEEDS IN MANITOBA
—TIMBER SEASONING INVENTION — AGRICUL-
TURAL WAGES IN U.S.A.

THE issue of the "International Labour Review" for September contains a very interesting survey of post-war agrarian legislation in Central Europe. The main purpose of the reforms is stated to be the democratic ownership of land, to be attained by dividing up the great estates and by strengthening peasant proprietorship. The land required for the purpose is acquired by different methods. In Germany, Austria, and Hungary, land belonging to or purchased from voluntary sellers by the state (under rights of pre-emption) is used for creating small farms. Should this means be insufficient for the purpose of reform a strictly limited right of expropriation can be sanctioned. In Czecho-Slovakia, Poland, Rumania and Lithuania, large-scale ownership as such is rejected and the new reform legislation is based on the principle that this class of ownership should be suppressed. There is in consequence no question of acquisition from voluntary sellers, but the maximum areas which can be held by individuals are fixed, according to the nature of the land, and expropriation of the rest is insisted on by the terms of the various Acts. In Esthonia and Latvia the properties subject to expropriation are not decided by maximum areas but are those belonging to a certain class of proprietors. The so-called "estates of the nobles" are to be totally expropriated. The method of compensation for expropriation has not yet been decided in these two states, but in the other countries special arrangements have been made for a full or partial payment by way of compensation (either in cash or in government stock), the valuations to be made generally on a pre-war basis.

The cultivation of estates in their present form is, as a rule, permitted by the new legislation, only when carried on by public institutions, such as agricultural schools or experimental stations, or similar undertakings, or when agricultural co-operative societies are the owners. In several agrarian laws the

co-operative cultivation of estates is expressly mentioned as one of the purposes of the reforms. While it is intended to parcel out expropriated lands to increase the size of already existing small holdings, the principal aim is invariably the creation of flourishing new small holdings. In introducing regulations as to the maximum size of the holdings, it is the hope of each state to create undertakings which will be independent both from the economic and social points of view. The dimensions fixed by each country vary according to the purpose of the holding and the nature of the land.

The persons entitled to acquire land set aside for purposes of agrarian reform embrace the following classes:—(1) Ex-service men, disabled ex-service men capable of work, and the dependents of soldiers fallen in the war; (2) Workers employed on the expropriated estates; (3) Other landless inhabitants of rural districts; (4) Former employees in the service of the State, in public service, and disabled ex-service men incapable of full work.

Almost all countries admit the preferential claims of persons in class (1) by which they are able partially to solve the problem of the ex-service man; socially by providing him with a means of livelihood, and financially by relieving the country of pensions obligations.

The general methods of assisting settlers to acquire land are either by some scheme for the granting of rent-titles under an authorised deed of transfer, which provides for the payment of a fixed annual rent (either in money or in kind) by the settler to the former owner, without the payment of any initial sum down, or by the establishment of settlement funds or rural banks, regulated by the government, for the purpose of granting loans. The principle that the settler shall not become complete owner of the land is contemplated in all countries under discussion.

Finally, with a view to maintaining the economic independence of the newly established holdings, special regulations have been laid down to guard against unskilful cultivation. Measures have been taken against the division or mortgaging of the holding, and the personal responsibility of the settler for the efficient working of the holding is clearly defined and can be enforced by the power of the State to re-purchase and dispossess the holder.

It is anticipated that the fundamental character of the new agrarian legislation, as incorporated in the various Acts which

have been passed during the last three years in the countries of Central Europe, will henceforward be maintained in spite of modifications in detail which may be introduced from time to time in the practical application of the reforms.

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THE *Experiment Station Record* for July, 1922, contains an account of the appropriations made by Congress for the expenditure of the U.S. Department of Agriculture during the year ending 30th June, 1923. The funds provided by the main Act are \$36,770,000 but there are also other funds available for meat inspection, agricultural education, forestry, bonuses on salaries, etc., which bring the total estimated expenditure of the Department up to about \$52,000,000 (say, £11,760,000 at the rate of exchange of \$4.42 to £1). This is not far from the amount provided for the previous year.

**Expenditure of the
U.S.A. Department
of Agriculture
for 1922-23.**

An interesting feature of the programme is the formation of a Bureau of Agricultural Economics, under the direction of Dr. H. C. Taylor, by the consolidation of the Office of Farm Management and Farm Economics with the Bureau of Markets and Crop Estimates. The provision for this Bureau amounts to about £804,500, of which, apart from the amounts for statutory salaries and general administrative expenses, £66,000 is allotted for the investigation of improved methods of farm management and practice (£34,000 being for cost of production studies), £106,000 for marketing studies, and £92,000 for the market news service. A number of Acts regulating agriculture and trade are administered by the Bureau, such as the Cotton Futures Act, Grain Standards Act, Packers and Stockyards Act, and the Future Trading Act. The cost of these is put at £300,000, and in addition £37,000 is appropriated for the operation of a market by the Department.

It may be pointed out that a number of duties are carried out by the U.S. Department of Agriculture which fall under other Departments than the Ministry of Agriculture in this country, *e.g.*, inspection of meat and other foods, forestry, and expenditure on road studies. The main divisions of work and the appropriations for them are as follows:—

						£
Animal Industry	...	...	...	...	...	1,576,000
Forest Service	...	...	...	...	...	1,485,000
Plant Industry	...	...	...	...	...	798,000
Chemistry	...	...	...	...	...	228,900
Soils	...	...	...	...	...	84,000
Entomology	...	...	...	...	...	402,300
Biological Survey	...	...	...	...	...	197,000
States Relations Service (Agricultural Instruction and allied work)	...	...	...	...	...	1,037,500
Agricultural Economics	...	...	...	...	...	804,500
Weather	...	...	...	...	...	435,600

An interesting item in the estimate for the Bureau of Animal Industry is a sum of £651,000 for the campaign against tuberculosis. In the course of this work during 1921 over 2,000,000 cattle were tested, of which about 3.9 per cent. reacted.

The Bureaux of Plant Industry and Entomology are responsible for heavy expenditure on the eradication of plant diseases and insect pests—*e.g.*, £80,000 and £45,000 respectively for the barberry and white pine blister-rust campaigns, and £40,000 on account of citrus canker. This last disease was thought to be practically eradicated, but the discovery of a new infestation necessitated a supplementary estimate of £34,000 in addition to the £6,000 at first provided. In the case of insect pests £136,000 is allowed for preventing the spread of the gipsy and browntail moths, and £45,000 for combating the European corn-borer.

The budget of the Bureau of Soils includes an item of £16,000 for the investigation of fertilisers and other soil amendments and their suitability for agricultural use.

The appropriations under the States Relations Service, dealing largely with aid to extension instruction in agriculture and domestic economy for boys and girls after leaving school, have been decreased from £1,097,000 to £1,038,000, but there will be other funds available for the work, such as £1,036,000 under the Smith-Lever Act.

The Weather Bureau's budget is increased by £9,000, mainly for its routine observations, but with £700 additional to extend the warnings given to fruit growers regarding impending frosts.

The approved estimates as a whole present few changes from those of recent years. The increased funds are generally for the carrying out of new regulations or for combating particular plant and animal diseases, and show the tendency of the U.S. Congress in late years to vote money for those purposes.

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THE agricultural appropriations or estimates of the Dominion of Canada for the year 1922-23 are given in the *Agricultural Gazette of Canada* for September-October, 1922. Provision is made for a total expenditure of \$5,989,000, or at the present rate of exchange approximately £1,345,900, compared with a total of £1,259,600 for 1921-22. The principal headings of expenditure are:—Experimental Farms £297,700. Diseases of Animals £401,100, Live Stock Improvement £238,200, Seed, Feeding Stuffs and Fertilisers Control £61,800, Destructive Insect and Pest Act £53,900, Dairying £39,300, Fruit £35,300.

The estimates of agricultural expenditure in 1922-23 for some of the Canadian Provincial Governments are also shown. For Ontario the total is £370,400, of which £129,600 is allocated to the Ontario Agricultural College. British Columbia will spend £85,300, the largest item in this province being for horticulture, viz., £23,500.

* * * * *

THE passing of an Act by the Nova Scotia Government requiring that on and after 1st May last, all cream delivered, sold or purchased at any creamery or cream station in the country must be graded as to quality, and payment made to the producer upon the basis of that grading, brings under notice the very careful system of encouragement and control exercised by the Provincial Government.

**Encouragement of
Dairying in
Nova Scotia.**

Under the Act for the Encouragement of Dairying passed in 1914, known as "The Dairymen's Act," the Governor in Council was authorised to expend 5,000 dollars per annum in assisting the establishment of creameries, aiding winter-dairying, and maintaining instructors in butter-making. A further sum of 20,000 dollars was later provided for the establishment of demonstration creameries and cheese factories, and the purchase of land necessary for the same. Other sums were authorised for the making good of any deficit in the maintenance of such demonstration creameries and cheese factories.

The Act also provided for the registration of all creamery and cheese factory proprietors and generally ensured that all creameries and cheese factories should maintain a high standard of cleanliness and of sanitary and mechanical methods. Careful records of tests of samples of milk and cream delivered by

producers were to be taken and kept for inspection, as well as delivered to each producer with payments for milk or cream.

The "Dairymen's Association of Nova Scotia" was founded by a later Statute, and an annual grant of 1,000 dollars provided for it. The main object of the Association was "the furthering of the dairy industry of Nova Scotia," and included the holding of an Annual Convention, the fostering of co-operation amongst dairymen, the holding of local dairy meetings, exhibitions of dairy products, and the education of dairymen.

Sufficient has been said to make it clear that the dairy industry in Nova Scotia is progressing upon careful and well-conceived lines. To show how it has extended—and there is room for very considerable extension in the province—the amount of creamery butter produced in 1911 was 275,000 lb., and in 1919, 2,093,000 lb. Even so, in 1918, 68 per cent. of the butter manufactured was still home-made, but the patrons of the creameries are increasing in number annually. The average yield per cow is increasing slowly. The Government Railways provide weekly refrigerator car services for butter, and producers can forward any amount from a 1 lb. package upwards for shipment at Halifax. It is expected that before long Nova Scotia will be able to ship butter in larger quantities to Great Britain and take its share in the market which awaits high-class colonial butters in this country.

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THE Noxious Weeds Act of the Legislative Assembly of Manitoba, which came into operation last year and takes the place of

**Injurious Weeds
in Manitoba.**

earlier legislation on the subject, imposes on all Local Authorities the duty of enforcing the destruction, in particular, of several kinds of thistles, and a variety of mustard which infests the corn-producing land of the Province.

The Act provides for the appointment by every Local Authority of at least one weeds inspector, who is to be employed solely in the inspection of lands and the supervision of weed destruction during the summer months. In the case of unorganized territory, similar appointments are made by the Lieutenant-Governor-in-Council.

The onus of destroying the scheduled weeds is placed on the occupier of the land, or, in the case of unoccupied land, on the owner or his agent. The primary duty of an inspector is to see that the work is properly carried out in his district, but in case

of failure to comply with the requirements of the Act, he has power to serve a notice requiring the occupier to cut down and destroy the weeds within a specified period, not exceeding fifteen days. If this warning is ineffective, the inspector may enter on the land and cause the weeds to be destroyed, when the occupier becomes liable to a fine, with a maximum of one year's imprisonment in default of payment.

The Act provides for the cost of destruction, in cases of failure to comply with notices served by an inspector, to be charged to the occupier, and collected in the same way as local taxes.

Two points of interest indicate the view of the Provincial Assembly that prevention is better than cure. In the first place, fines up to one hundred dollars may be inflicted on dealers who sell grain, grass seed, or food products containing a greater proportion of noxious weed seeds than is allowed by the regulations made under Dominion legislation. Secondly, provision is made, under penalties for failure to comply, for threshing machines to be cleaned after the completion of each operation and before the machine is moved, in order to prevent the seeding of clean land with weeds.

One other special provision is, perhaps, worthy of mention. Owners of land are prohibited by the Act from letting any land upon which noxious weeds exist without giving the prospective tenant written notice of the condition of the land, as reported by the local inspector, and obtaining from him a statement that he is prepared to accept all responsibility.

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A PROCESS for seasoning timber by subjecting it to the action of a current of air containing a certain percentage of ozone has

**Timber-Seasoning
Invention.**

been invented by M. Otto, Professor at the Sorbonne, Paris. The process is said to give the same result in about twenty days as would be obtained by natural seasoning in the course of several years. A micrographic examination is reported to show that samples of oak and walnut which had been treated by the process show the same characteristics as seasoned wood, while the treatment does not change the colour of the wood. The Otto process is being worked by a French Company which has constructed works at Seregno, near Milan, and will shortly build new works in the neighbourhood of Paris.

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THE International Labour Office quote figures issued by the United States Department of Agriculture which show that as compared with 1916 (the year preceding that in which the United States entered the war) farm wages had increased by 100 per cent. in 1920. These rates were the highest recorded, and during 1921 they fell by about 35 per cent., leaving wages only about 30 per cent. above the 1916 level.

**Fall in Agricultural
Wages in the
United States.**

* * * * *

LICENSING OF STALLIONS UNDER THE HORSE BREEDING ACT, 1918.

SEASON 1922.

THE Horse Breeding Act of 1918 has been in operation since 1st January, 1920. The main object of the Act is to prevent unsound stallions being travelled for service and there is every reason to think that this is now being secured. Applications for licences to travel must be made to the Ministry between 1st November and 31st July, and all licences expire on the 31st October following the date of issue.

The diseases and defects prescribed in the Horse Breeding Regulations of 1919 for England and Wales as rendering stallions unfit for the service of mares are:—roaring, whistling, sidebone, cataract, ringbone (high or low), bone spavin, navicular disease, shivering, stringhalt, and defective genital organs. The returns given in Table II show that the first three named diseases or defects are the most prevalent.

The number of stallions which were licensed by the Ministry during the year ended 31st October last was 3,479, of which 3,129 were pedigree horses, the remainder not being entered, or accepted for entry, in any recognised stud book. In 165 cases applications for licences were refused by the Ministry. An appeal against the refusal of a licence was lodged under paragraph 12 of the Regulations in 28 cases, and 12 of the appeals were successful.

As in the preceding year, the Police co-operated with the Inspectors of the Ministry in securing observance of the Act by stopping stallions on the road and requiring the production of licences by the stallion leaders. Proceedings were taken by the Police in several cases where offences were proved, but there were fewer prosecutions than in previous years. It seems reasonable to assume therefore that evasions of the Act are diminishing.

TABLE I.

Pedigree Stallions, <i>i.e.</i> , Stallions entered or accepted for entry in the recognised Stud Book of their Breed	HEAVY				LIGHT				PONY AND COB											Totals			
	Breeds				Breeds				Breeds														
	Shire	Clydesdale	Suffolk	Percheron	Hackney	Thoroughbred	Arab	Cleveland Bay	Welsh Roadster	Hunter	Yorkshire Coach	American Trotter	—	Welsh	Fell	Dales	Polo and Riding	Shetland	Highland		Dartmoor	Welsh Cob	—
Licensed	2,052	237	216	47	—	213	150	17	9	5	4	2	1	—	28	24	18	8	3	1	76	—	3,129
Refused	106	16	8	—	—	5	7	1	—	—	—	—	—	—	1	2	—	—	—	—	—	—	146
Applications	2,158	253	224	47	—	218	157	18	9	5	4	2	1	—	29	26	18	8	3	1	76	—	3,275

Non-Pedigree Stallions, <i>i.e.</i> , Stallions not entered or accepted for entry in a recognised Stud Book	Types				Types				Types							Totals								
	Types				Types				Types															
	Shire	Clydesdale	Suffolk	Percheron	Others	Hackney	Thoroughbred	Arab	Cleveland Bay	Welsh Roadster	Hunter	Yorkshire Coach	American Trotter	Others	Welsh		Fell	Dales	Polo	Shetland	Highland	Dartmoor	Welsh Cob	Others
Licensed	122	7	2	2	80	41	4	3	—	1	3	—	4	18	5	2	13	2	—	—	—	29	12	350
Refused	8	1	1	—	5	2	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	19
Applications	130	8	3	2	85	43	4	3	—	1	3	—	4	18	5	2	14	2	—	—	—	30	12	369

Total Licensed	2,174	244	218	49	80	254	154	20	9	6	7	2	5	18	33	26	31	20	8	3	1	105	12	3,479
Total Refused	111	17	9	—	5	7	7	1	—	—	—	—	—	—	1	2	1	—	—	—	—	1	—	165
Total Applications	2,288	261	227	49	85	261	161	21	9	6	7	2	5	18	34	28	32	20	8	3	1	106	12	3,644

TABLE II.

BREED	Number of Applications	Number of Refusals	Percentage of Refusals	REASONS FOR REFUSAL									
				Whistling	Roaring	Sidebone	Ringbone	Cataract	Stringhalt	Shivering	Defective Genital Organs	Bone Sparin	Undeveloped Prolific
Pedigree													
Shire ...	2,158	106	4.91	33	31	17	10	6	1	7	1	—	—
Clydesdale ...	253	16	6.32	2	3	7	—	1	3	—	—	—	—
Suffolk ...	224	8	3.57	2	1	1	1	2	—	—	1	—	—
Hackney ...	218	5	2.29	1	—	—	—	2	2	—	—	—	—
Thoroughbred ...	157	7	4.46	—	—	—	1	—	1	—	3	1	1
Arab ...	18	1	5.56	—	—	—	—	—	1	—	—	—	—
Welsh Pony ...	29	1	3.45	—	—	—	—	—	—	—	1	—	—
Fell Pony ...	26	2	7.69	—	—	—	1	—	1	—	—	—	—
Non-Pedigree													
Heavy ...	228	15	6.58	1	2	4	3	2	1	1	—	1	—
Light ...	76	2	2.63	—	—	—	—	1	1	—	—	—	—
Pony and Cob ..	65	2	3.08	—	—	—	—	1	—	—	—	1	—
Total of Refusals ...	—	165	—	39	37	29	16	15	11	8	6	3	1

Licences which were in use during the past travelling season expired on 31st October and should then have been returned to the Ministry. Holders of licences who have not yet so returned them should do so immediately, whilst applications for licences or renewals for the 1923 season should be made at as early a date as possible to facilitate arrangements for the examination of the stallions. Forms of application for a licence may be obtained from the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, S.W.1.

* * * * *

AGRICULTURAL RETURNS, 1922.

PRODUCE OF CROPS IN ENGLAND AND WALES.

Preliminary Statement showing the estimated total produce and yield per acre of the Corn and Hay Crops in England and Wales in 1922, with comparisons for 1921, and the average yield per acre of the ten years 1912-21.

Crops.	Estimated Total Produce.		Acreage.		Estimated Yield per Acre.		Average of the Ten Years 1912-21.
	1922.	1921.	1922.	1921.	1922.	1921.	
	<i>Quarters.</i>	<i>Quarters.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
Wheat ...	7,649,000	8,722,000	1,966,826	1,975,979	31·1	35·3	30·7
Barley ...	5,060,000	5,309,000	1,363,812	1,435,575	29·7	29·6	30·9
Oats...	9,281,000	10,033,000	2,157,172	2,147,594	34·4	37·4	38·3
Mixed Corn	509,000	570,000	123,823	134,898	32·9	33·8	
Beans ...	839,000	778,000	272,068	237,174	24·7	26·2	27·3
Peas...	261,000	313,000	122,717	105,699	17·0	23·7	24·7
	<i>Tons.</i>	<i>Tons.</i>			<i>Cwt.</i>	<i>Cwt.</i>	<i>Cwt.</i>
Seeds Hay*	1,732,000	2,144,000	1,527,646	1,757,536	22·7	24·4	28·4
Meadow Hay†	4,068,000	3,195,000	4,413,118	4,052,450	18·4	15·8	21·5

* Hay from Clover, Sainfoin, and Grasses under rotation.

† Hay from Permanent Grass.

The corn crops of this year are generally less favourable than those of 1921, both as regards yield per acre and condition and quality of the grain. The unsatisfactory yields are due mainly to the spring drought, although the cold, wet summer also had a bad effect. Autumn-sown crops came through the winter fairly well, in spite of a rather severe check occasioned by cold weather in March and April, which also caused spring corn to germinate slowly. Spring crops, where sown late, suffered most from the dry weather, and frequently came up thin plants, while in some districts frit fly and wireworm damaged the oats severely. Crops ripened slowly and unevenly, and, with unfavourable weather at harvest, the ingathering was very protracted, and a fair proportion of the crops was harvested in rather damp condition. Wheat, however, is of very fair quality, and winter oats are generally fairly satisfactory, but spring oats are of inferior quality, the grain being light. Much barley is discoloured, with a poor sample where there were two growths, and the proportion fit for malting is less than usual.

Wheat is the only corn crop to give an over-average yield, the yield per acre being estimated at 31·1 bushels, or nearly half a bushel above the average of the ten years 1912–21, but more than 4 bushels below the record crop of last year. Most eastern counties obtained appreciably heavier yields than usual, Norfolk being an outstanding exception. The total production is estimated at 7,649,000 quarters, or 1,070,000 quarters less than in 1921, but 700,000 quarters greater than the pre-war average. The total production of barley, 5,060,000 quarters, is 250,000 quarters less than last year and, apart from 1915, is the smallest recorded since official returns were first collected in 1885. The yield per acre is estimated at 29·7 bushels, or practically the same as in 1921, and about $1\frac{1}{4}$ bushels per acre below average. Counties in which fen land predominates secured better crops than usual, but under-average yields were the rule in practically all other counties. The yield per acre of oats, 34·4 bushels, is 4 bushels per acre below the ten-year average. This yield per acre is also slightly under the lowest previously recorded. Yields were relatively the worst in Norfolk, Shropshire, Derby, and Stafford, but in hardly any counties were they up to average. The total production of 9,281,000 quarters is the smallest since 1912, and 750,000 quarters less than in 1921. Mixed Corn yielded 32·9 bushels per acre, and the total production of 509,000 quarters is some 60,000 quarters less than last year. As a result of the increased acreage, the total production of beans, 839,000 quarters, is 60,000 quarters greater than in 1921, in spite of a poorer crop. The yield of 24·7 bushels per acre is $1\frac{1}{2}$ bushels less than last year, and $2\frac{1}{2}$ bushels below average. Peas are by far the worst crop on record, the yield per acre being estimated at only 17 bushels, or $7\frac{3}{4}$ bushels below the ten-year average, and $1\frac{3}{4}$ bushels less than the previous lowest in 1885. The total production of 261,000 quarters is 52,000 quarters less than last year, and lower than in any year, except 1916 when practically a similar total crop was obtained from an area about 30 per cent. less.

The growth of hay was retarded by the cold, dry spring, and much of the seeds was a thin plant as a result of the drought of 1921, so that hay crops were also very unsatisfactory. Most of the seeds hay was secured in good condition, but the bulk of the meadow hay was more or less weathered, and the quality of a fair proportion was impaired owing to delay in cutting. Seeds hay gave a total crop of only 1,732,000 tons, which is the smallest production since 1893, and about 400,000 tons less than in 1921. The yield per acre of 22·7 cwt., is $1\frac{3}{4}$ cwt. less than last year, and $5\frac{3}{4}$ cwt. below the ten-year average. It will be understood that these figures apply to the area of seeds actually cut for hay, and take no account of the area of seeds ploughed up. Yields were very light in practically every county, though they were relatively better in the north and in Wales than in other parts of the country. Meadow hay yielded better than last year, being estimated at 18·4 cwt. per acre, against 15·8 cwt. in 1921, but still some 3 cwt. per acre below average. The acreage was greater than in 1921, so that the total production of 4,068,000 tons shows a welcome increase of 870,000 tons. The total quantity of hay produced this year is therefore about 5,800,000 tons, or 460,000 tons more than in 1921, but still some 1,500,000 tons below the average of the ten years, 1912–21.

The estimates of the potato and root crops will be issued later in the year.

PRODUCE OF HOPS.

Preliminary statement showing the estimated total production of Hops in the years 1922 and 1921, with the acreage and estimated average yield per statute acre in each county of England in which Hops were grown ; and the average yield per acre of the ten years 1912—1921.

COUNTIES, &c.			Estimated Total Produce.		Acreage returned on 4th June.		Estimated Average Yield per Acre.		Average of the ten years 1912 to 1921.
			1922.	1921.	1922.	1921.	1922.	1921.	
KENT	East ...	Cwt.	46,000	39,000	Acres	4,095	Cwt.	11·2	Cwt.
	Mid ...	Cwt.	72,000	52,000	Acres.	4,005	Cwt.	9·6	11·4
	Weald ...	Cwt.	88,000	52,000	Acres.	5,414	Cwt.	13·1	12·0
	Total, Kent	Cwt.	206,000	143,000	Acres.	6,634	Cwt.	12·4	10·7
HANTS	...	Cwt.	11,000	9,000	Acres.	1,073	Cwt.	10·3	8·4
SURREY	...	Cwt.	2,200	1,500	Acres.	1,043	Cwt.	8·4	9·9
SUSSEX	...	Cwt.	33,500	12,700	Acres.	217	Cwt.	10·1	7·4
HEREFORD	...	Cwt.	30,000	33,000	Acres.	2,354	Cwt.	14·2	5·7
WORCESTER	...	Cwt.	17,700	24,000	Acres.	2,269	Cwt.	7·6	9·9
OTHER COUNTIES*	...	Cwt.	500	760	Acres.	3,945	Cwt.	8·7	9·5
TOTAL	...	Cwt.	301,000	224,000	Acres.	2,032	Cwt.	8·7	12·1
		Cwt.			Acres.	95	Cwt.	5·2	8·7
		Cwt.			Acres.	87	Cwt.	8·7	6·7
		Cwt.			Acres.		Cwt.	11·4	8·9
		Cwt.			Acres.		Cwt.	8·9	10·4

* Salop, Gloucester, Berkshire and Suffolk.

NOTE.—The total production this year is estimated at 301,000 cwt., or 77,000 cwt. more than last year, and 26,000 cwt. above the average of the ten years 1912-21. Except in East Kent the yields per acre were above average in the south-eastern counties, especially in Sussex where a heavy crop of 14·2 cwt. per acre was obtained. In the western counties yields were not so satisfactory, being half a hundredweight below average in Herefordshire and just average in Worcestershire. Results this year were therefore the reverse of those of last year, when the western counties had good crops and the south-eastern counties lighter crops than usual.

* * * * *

Foot-and-Mouth Disease.—Since the outbreak at Harmondsworth, Middlesex, on 20th October, which was referred to in the last issue of *The Journal*, eight further outbreaks have occurred of which four were in the district to which restrictions were applied consequent upon the discovery of disease at Harmondsworth, the remaining four outbreaks being confirmed in the Woodstock district of Oxfordshire.

In the Home Counties area, outbreaks were confirmed at Walton-on-Thames (Surrey) on 28th October, Windlesham (Surrey) on 30th October, Staines (Middlesex) on 30th October, and Worplesdon (Surrey) on 13th November, but no connection could be traced between any of these and the original outbreak at Harmondsworth, nor were the later outbreaks apparently connected with each other. The outbreaks at Windlesham and Worplesdon rendered it necessary to extend the district subject to restrictions. The entire prohibition of movement of animals is now limited to five small areas around the other infected places. In the remainder of the scheduled area which has been

considerably reduced, movement is permissible by licence, and fat stock markets can be held by licence subject to inspection.

The initial outbreak in Oxfordshire occurred on 25th October, when two cases were confirmed at Woodstock. The usual Order was imposed in respect of an area with a radius of 15 miles of the infected places. Subsequently, two outbreaks occurred on 30th October and 4th November respectively, on premises in the vicinity of the earlier cases. The origin of the infection in this district cannot be ascertained, but all the 4 outbreaks were connected.

In this district also the restrictions have been considerably modified and entire prohibition of movement applies only in respect of two small areas surrounding the infected premises.

In all cases, the slaughter of all the affected animals and those in immediate contact has been carried out, involving 107 cattle, 2 sheep, 207 pigs and 1 goat.

Agricultural Research Scholarships and Fellowships.—The Ministry of Agriculture and Fisheries, on the recommendation of the Advisory Committee on Agricultural Science, and with the concurrence of the Development Commissioners and the Treasury, have awarded *Research Scholarships*, of the value of £200 per annum for three years, to the following candidates :—

Mr. N. C. Wright, University College, Reading (Dairying).

Mr. W. L. Davies, University College, Aberystwyth (Animal Nutrition).

Mr. Ronald C. Fisher, Edinburgh University (Entomology).

Mr. P. Halton, University College, Reading (Animal Nutrition).

Mr. Edgar Thomas, University College, Aberystwyth (Agricultural Economics).

The Ministry has also extended for a third year the 2-year scholarships previously awarded to :—

Mr. J. H. Frew (Rothamsted Experimental Station) in Entomology ; and to

Miss M. S. Lacey (Imperial College of Science) in Plant Bacteriology.

These scholarships have been established in order to assist promising science graduates to qualify as research workers with a view to their contributing to the development of agricultural science.

Travelling Research Fellowships have been awarded to :—

Mr. G. W. Robinson, of University College, Bangor, for a visit to America to study soil survey methods ; and to

Col. W. A. Wood, of the School of Agriculture, Cambridge, for a visit to Kiel to study methods of treating sterility.

The fellowships have been instituted to enable selected members of the staffs of institutions aided by the Ministry to visit foreign countries where research work on similar subjects is carried on and to study at first hand the methods followed there.

International Poultry Exhibition.—An International Poultry Exhibition will be held at Liege on 20th—22nd Jan. next, and entries of five or six pens of three birds each are invited from British breeders. Belgian poultry breeders are particularly interested in such breeds as Orpingtons, Minorcas, Sussex, and Dorkings. Inquiries should be addressed to the Secretary, International Exhibition of Aviculture, Société Royale Union Avicole de Liege, Belgium.

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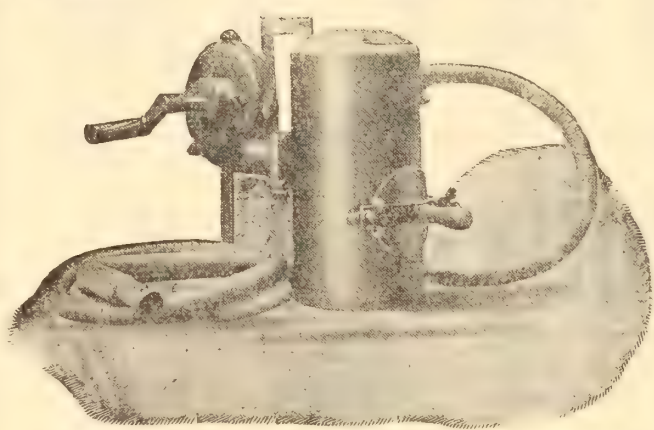
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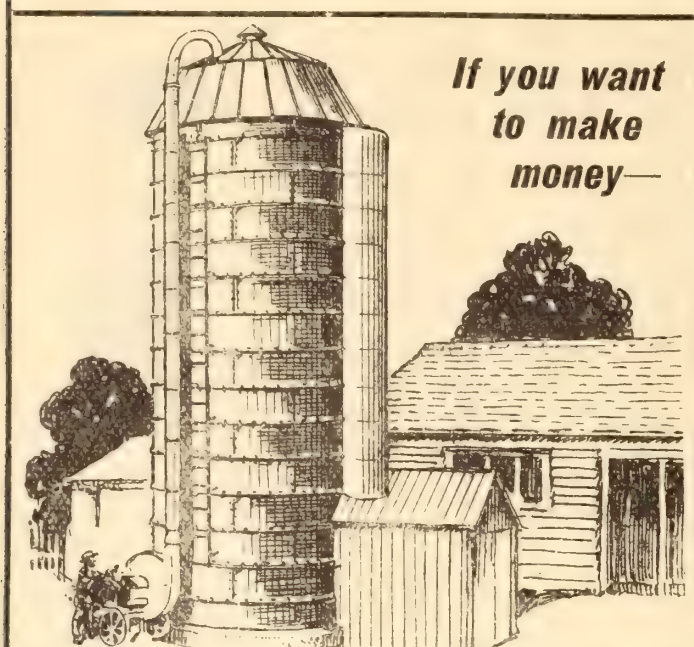
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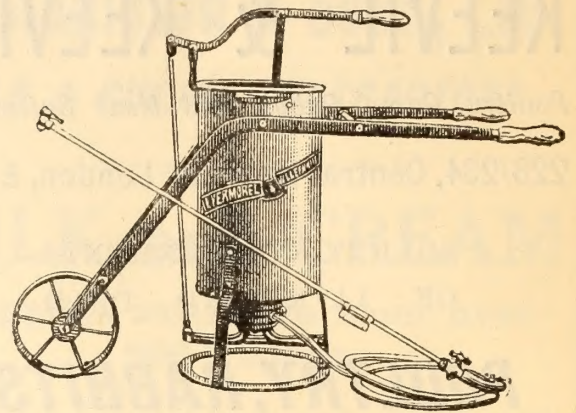
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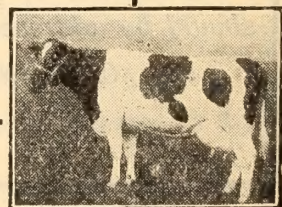
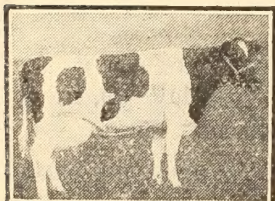
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